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Abstract

This study investigated the ability of second-grade children to employ initial and final consonant substitution as a technique in word identification. An instrument of 44 one-syllable simulated words and a measurement to ascertain consonant phoneme knowledge were used to study 90 second-grade pupils, approximately equal in general characteristics. The children were asked to recall a known word visually similar to an unknown word, except for an initial or final consonant, and to pronounce the unknown word by association with the known one. Significant relationships were found in the following cases: (1) between the student's abilities to recall a known word visually similar to the simulated word and to correctly identify the simulated word by means of single consonant substitution, (2) between the abilities to substitute initial consonants and to substitute final consonants, and (3) between reading achievement and ability to employ consonant substitution to identify simulated words. It was concluded that second-grade children can effectively employ single consonant substitution to identify unknown one-syllable words. (LH)

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FINAL REPORT

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IDENTIFYING UNKNOWN WORDS THROUGH ASSOCIATION WITH KNOWN WORDS: CONSONANT SUBSTITUTION AS A TECHNIQUE IN WORD IDENTIFICATION

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University of Missouri--Columbia
Columbia, Missouri
August 1969

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IDENTIFYING UNKNOWN WORDS THROUGH ASSOCIATION WITH KNOWN WORDS: CONSONANT SUBSTITUTION AS A TECHNIQUE IN WORD IDENTIFICATION

CHAPTER I

INTRODUCTION

I. THE PROBLEM

This study is an investigation of the ability of second-grade children to employ initial and final consonant substitution as a technique in word identification. Though this procedure is employed in a number of reading programs and advocated by certain linguists as a method of word identification, the ability of children in early reading stages to use the procedure has not been examined objectively. The process of initial and final consonant substitution demands the ability to recall a known word that is visually similar to an unknown word (except for the initial or final consonant) and to pronounce correctly the unknown word by the substitution process. It was the child's ability to engage in these acts that this study attempted to investigate.

Statement of the Problem

More specifically, the following question was investigated:

> Is the ability of second-grade children to recall a known word visually similar to a simulated word associated with their ability to identify correctly the same simulated word by means of initial and final consonant substitution?

In order to investigate the above question, the following null hypotheses were tested:

1. There is no association between the ability to recall a known word visually similar to a simulated word (except for the initial consonant) and the ability to identify correctly the simulated word by means of initial consonant substitution.

2. There is no association between the ability to recall a known word visually similar to a simulated word (except for the final consonant) and the ability to identify correctly the simulated word by means of final consonant substitution.

3. There is no relationship between the ability to employ initial and final consonant substitution in the identification of simulated words.

4. There is no difference among groups of children classified as high, average, and low in general reading achievement in their ability to identify simulated words correctly by means of initial consonant substitution.

5. There is no difference among groups of children classified as high, average, and low in general reading achievement in their ability to identify simulated words correctly by means of final consonant substitution.

Importance of the Study

It is an axiom that one of the abilities involved in the reading act is that of perceiving independently the unknown words that one meets. Therefore, instruction in effective word identification is basic to the entire art of reading. Skill in these processes is a fundamental part of the equipment of a capable reader at any level. As reading maturity progresses, demands become greater for more and more independent word identification. Any child who has failed to establish effective means of identifying and recognizing words will be handicapped in all other aspects of reading.[1] Consequently, the foundation of the reading process is word identification. Children cannot be expected to comprehend, react to, or be influenced by ideas of authors if they are unable to identify words that convey ideas. One of the major goals in good reading programs is developing the ability to perceive words independently.[2]

Smith designated the first large area in skill development as word identification. However, she cautioned that it is not enough to consider this as one large area. Word identification has many divisions of skills that contribute to the large area but differ from one another. One of these skills is phonic analysis which also incorporates several subskills. Smith stated that:

> We must know what the several different skills are that prove helpful to children in identifying

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[1] Guy L. Bond and Miles A. Tinker, Reading Difficulties: Their Diagnosis and Correction (second edition; New York: Appleton-Century-Crofts, Inc., 1967), pp. 303-304.

[2] William S. Gray, On Their Own in Reading (revised edition; Chicago: Scott, Foresman and Company, 1960), p. 13.

> unrecognized words and what we can do in developing each of these different skills.[3]

One subskill within the area of phonic analysis was advocated by Gray as a beginning method for instruction in independent word identification. This skill became known as consonant substitution. Gray explained the reasoning behind his choice. He considered the ultimate aims in word identification to be: (1) development of ability to recognize a large number of words that are highly useful; and (2) development of word attack skills that will enable identification of unfamiliar words independently. In beginning reading instruction a given number of words are taught as sight words. These known words form a basis for the beginning of word attack and for developing sound-symbol relationships. Gray believed that the first method of word attack children could use was that of substituting initial and final consonant sounds in previously known one-syllable words. He advocated use of consonants first because they formed the distinguishing framework of words and were more regular in correspondence between sound and symbol. This method of word attack is a part of phonic analysis, and Gray labeled the technique consonant substitution.[4] He explained the process as follows:

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[3] Nila Banton Smith, Reading Instruction for Today's Children (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963), p. 165.

[4] Gray, op. cit., pp. 31-40.

> As soon as a child can associate a few consonant sounds with the letters that represent them, he learns to analyze an unfamiliar word that looks like a word he knows except for an initial or final consonant letter.[5]

An example to illustrate the procedure would be that knowledge of pet should assist a child in pronouncing let by initial consonant substitution, and knowledge of sat should assist a child in pronouncing sad by final consonant substitution.

Gray believed that children should not establish the habit of analyzing new words by sounding their way through letter-by-letter, nor should they learn the sounds of letters in isolation rather than as parts of whole words. He considered one of the values in the process of consonant substitution to be that of developing in children the ability to blend sounds rapidly and smoothly into words.[6] Gray stated that for grade one:

> The substitution of one phonetic element for another is one of the simplest ways of applying knowledge of phonetic elements. . . . This simple application skill enables even the immature reader to grasp many new words.[7]

Several abilities listed by Gray are considered prerequisites for children to employ consonant substitution techniques effectively in identifying unfamiliar words: (1) ability to recall from memory the form of a known word; (2) ability to note similarity in form between the known and unfamiliar word; (3) ability to associate sound with a few consonant letters; and (4) ability to blend an initial or final consonant sound with the remaining sounds in a word and identify the unfamiliar word.[8]

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[5] *Ibid.*, p. 41. [6] *Ibid.*

[7] William S. Gray and Lillian Gray, *Developing Word-Attack Skills Grades 1-3* (New York: Scott, Foresman and Company, 1947), p. 7.

In surveying the literature it was found that the technique of consonant substitution is currently advocated by leading reading authorities and is employed in reading instructional materials, particularly in first and second grades. Harris stated that:

> For the majority of children substitution seems to work satisfactorily. Although experimental comparisons of the different kinds of phonic methods are not available, substitution techniques are at present preferred by the majority of authors of basal readers and therefore are the methods by which most of today's children are trained in word attack.[9]

One of the eight principles Chall listed as being incorporated in the most widely used basal reading series and teachers' guides from 1930 to the early 1960s was the process of identifying unknown words through visual analysis and substitution.[10] In 1962 Artley commented that most basal series in grade one included consonant substitution techniques.[11] Kottmeyer also indicated that many modern reading series employ consonant substitution in their word analysis programs.[12] Heilman labeled consonant substitution "the process of thinking the sounds or mental substitution" and considered the technique defensible as well as desirable.[13] He stated that "practically all workbooks" use a number of monosyllabic words containing often-used letter combinations as a means of teaching new words.[14] Other authorities have also given credence to the consonant substitution technique. Spache believes that this process should be given "ample attention and practice in order that other phonic learnings will function."[15] According to

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[8] Gray, On Their Own in Reading, op. cit., p. 78.

[9] Albert J. Harris, How to Increase Reading Ability (fourth edition; New York: David McKay Company, 1961), p. 338.

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[10] Jeanne Chall, Learning to Read: The Great Debate (New York: McGraw-Hill Book Company, 1967), p. 15.

[11] A. Sterl Artley, "Phonic Skills in Beginning Reading," Education, LXXXII (May, 1962), 532.

[12] William Kottmeyer, Teacher's Guide for Remedial Reading (St. Louis: Webster Publishing Company, 1959), pp. 10-11.

[13] Arthur W. Heilman, Phonics in Proper Perspective (second edition; Columbus, Ohio: Charles E. Merrill Publishing Company, 1968), pp. 39, 103.

[14] Arthur W. Heilman, Principles and Practices of Teaching Reading (second edition; Columbus, Ohio: Charles E. Merrill Publishing Company, 1967), p. 272.

[15] George D. Spache, Reading in the Elementary School (eighth printing; Boston: Allyn and Bacon, Inc., 1968), p. 301.

Smith, consonant substitution provides one of the most satisfactory ways of proceeding from known to unknown in word identification.[16] Harris also commented that the technique avoids distortion of sounds and difficulty in blending since emphasis is not placed on isolated drill.[17] Tinker and McCullough advocated the method for the same reason, as known words form the basis for substitutions.[18] These authors stated:

> It is easier for the child to learn consonant substitution as a method of word analysis than to learn long lists of phonograms. Furthermore, his attention is directed to complete pronounceable units instead of vowel-consonant combinations. This is desirable because it fosters the perception of total word forms. Mastery of the substitution technique will facilitate the identification of many new words. The technique is applicable throughout the elementary grades.[19]

Bond and Tinker lend support to the use of consonant substitution in remediation. They believe children need to learn a vast number of word parts. The larger the elements a child can use in word identification, the more fluent his reading. These authors refer to consonant substitution as "usable word-element knowledges," meaning that a child must grasp flexibility in choosing the most appropriate word element for particular words since a useful element in one word may not be suitable in another, as (on in upon and portion).[20]

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[16] Smith, op. cit., pp. 208-209.

[17] Albert J. Harris, Effective Teaching of Reading (New York: David McKay Company, Inc., 1962), p. 192.

[18] Miles A. Tinker and Constance M. McCullough, Teaching Elementary Reading (third edition; New York: Appleton-Century-Crofts, Inc., 1968), p. 178.

[19] Ibid., p. 174.

Fernald was also a supporter for consonant substitution though she did not label it as such. She believed that a number of experiences with different words having similar combinations would assist in more accurate word identification and that visual matching activities were not necessary in order to have one word suggest another. Her belief was that one calls to mind similarities after many experiences with words having similar combinations.[21]

Though Fernald, Bond, and Tinker seemed to favor consonant substitution for disabled readers, there are authorities who raise questions regarding its value. Harris believes that the technique would be difficult for children with poor visual abilities but who show an aptitude for auditory techniques. He advocates a sounding-blending method rather than consonant substitution.[22] Kottmeyer considers consonant substitution of limited usefulness for disabled readers because of the need for a large sight vocabulary to utilize it effectively. He stated:

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[20] Bond and Tinker, op. cit., pp. 323-24, 327-28.

[21] Grace M. Fernald, Remedial Techniques in Basic School Subjects (New York: McGraw-Hill Book Company, Inc., 1943), p. 54.

[22] Harris, How to Increase Reading Ability, op. cit., pp. 337-38.

> Consonant substitution appears to be a simple process, and it is--when it is demonstrated on the board by a teacher. But when a slow-learning pupil looks at an unfamiliar word form, he must conjure up the visual image of the sight word which belongs to the same family and must note the similarity and difference between the image and the word before his eyes. Simultaneously, the pupil must recall the new beginning consonant of another word and must mentally extract and substitute the sound for the one he sees. This process requires more power of visual imagery than the typical remedial reading pupil has.[23]

Emans also emphasized that "such a procedure does seem complicated."[24] Artley has stated that the process of consonant substitution requires careful practice, especially in hearing, remembering, and picturing words mentally.[25]

Though many authorities have commented regarding the use of consonant substitution as a beginning word attack skill, there is little research in the field of reading to substantiate its effectiveness. However, in studies involving the relationship between specific word identification skills employing consonant substitution and reading achievement, it has been found that ability to employ the skill seems to be related to reading achievement.[26]

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[23] William Kottmeyer, op. cit., p. 11.

[24] Robert Emans, "Phonics: A Look Ahead," Elementary English, XLVI (May, 1969), 578.

[25] A. Sterl Artley, Your Child Learns to Read (Chicago: Scott, Foresman and Company, 1953), p. 82.

Two linguists have based their theories concerning initial reading instruction on a child's ability to employ consonant substitution in word identification. Words are presented in patterns that have a one-to-one relationship between sound and symbol (can, ran, van); and, with a great deal of repetition, children are expected to be able to recognize the consistency and to transfer automatically to unknown words that are similar except for the initial or final consonant. Bloomfield and Barnhart commented: "If the child has learned the pattern of a list of actual words, he should be able to read nonsense syllables using the same pattern."[27] Barnhart believed with Bloomfield that if words are presented together which are similar in sound and spelling, children will transfer easily to unknown words with the same pattern without teacher guidance.[28] From presentation of reading material in which sound-symbol relationships were completely consistent, Bloomfield moved to more complex stages. Stage two consisted of regular spellings in which double consonants and other digraphs appeared (thin, shin; well, sell; road, toad). Stage three contained semi-irregular words (line, shine; bone, stone); and stage four initiated the irregular spellings (night, light; rough, tough).[29]

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[26] Ben H. Hackney, Jr., "Reading Achievement and Word Recognition Skills," The Reading Teacher, XXI (March, 1968), 515-18.

[27] Leonard Bloomfield and Clarence L. Barnhart, Let's Read--A Linguistic Approach (Detroit: Wayne State University Press, 1961), p. 41.

[28] Ibid., p. 42.

Fries advocated the use of common consistent spelling-patterns in the initial stage of reading instruction so that the child will be able to discover for himself the relationships between sounds and letters. He believed that the regularity of word presentation decreases confusion and develops a considerable range of habitual responses to specific patterns of graphic shapes which will enhance reading instruction.[30] Fries stated:

> The first step toward reading must always be learning to notice the contrastive identifying features of the graphic shapes and to recognize patterns as they recur.[31]

Fries identified sets of spelling-patterns which he considered to be a basic necessity for reading. However, he believed the first and perhaps most significant set of spelling-patterns to be those for one-syllable words with the general shape of consonant-vowel-consonant.[32] He did not emphasize the sounds of separate letters in spelling-patterns. Fries believed that children understand the differences among sound-symbol relationships from the experience of pronouncing a variety of word pairs with minimal differences in their spelling-patterns, for example (cat, rat). He would also move to more complex patterning (man, mane, mean).[33]

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[29] Leonard Bloomfield, "Linguistics and Reading," Elementary English Review, XIX (May, 1942), 185.

[30] Charles C. Fries, Linguistics and Reading (New York: Holt, Rinehart and Winston, Inc., 1963), pp. 120-21.

[31] Ibid., p. 127. [32] Ibid., p. 171.

Sofietti also advocated a method similar to Bloomfield's in which there is control of sound-symbol relationship in the beginning with gradual introduction to exceptions.[34] Hall would agree with the above linguists who introduce initial words on the basis of grouped consistencies in sound-symbol relationships.[35]

Recent investigations regarding regularity of the English language have indicated that our language is more consistent than was once believed. Despite some irregularities, important consistencies exist in sound-symbol relationships.[36, 37] Heilman stated that "possibly these should be exploited to a large degree in reading instruction."[38] Consideration for possible advocacy of more consistency in sound-symbol relationships in reading programs was one recommendation gleaned from the cumulative analysis of the twenty-seven first grade reading studies conducted throughout the United States in 1964 and 1965. Cross-analyses of the studies indicated superior word recognition abilities for children exposed to words of greater consistency in sound-symbol correspondences.[39]

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[33] *Ibid.*, p. 204.

[34] James P. Sofietti, "Why Children Fail to Read: A Linguistic Analysis," *The Harvard Educational Review*, XXV (Spring, 1955), 63-84.

[35] Robert A. Hall, Jr., *Sound and Spelling in English* (New York: Chilton Books, 1961), p. 49.

In psychological research on the ability to transfer from known to unknown words, results of several studies indicated that adults as well as children were able to identify unknown (pseudo) words that resembled English words of high spelling-to-sound correlation. Inferences were drawn regarding the ability of subjects to generalize automatically certain consistent predictions of sound-symbol

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[36] Richard E. Hodges and E. Hugh Rudorf, "Searching Linguistics for Cues for the Teaching of Spelling," Elementary English, XLII (May, 1965), 529.

[37] Richard L. Venezky, "English Orthography: Its Graphical Structure and Its Relation to Sound," Reading Research Quarterly, II (Spring, 1967), 103.

[38] Heilman, Principles and Practices of Teaching Reading, op. cit., p. 252.

[39] Guy L. Bond and Robert Dykstra, "The Cooperative Research Program in First-Grade Reading Instruction," Reading Research Quarterly, II (Summer, 1967), 123-24.

correspondence which correlated with words they already knew from previous experience.[40, 41] Smith and Dechant stated that "transfer is fostered when the child recognizes that what he is learning fits into the framework of what he already knows."[42] Other psychological studies have shown that frequency of past usage and familiarity have a strong relationship to ability to identify unknown words.[43]

Reading authorities and linguists employing the consonant substitution technique in the initial stages of reading instruction assume that children possess ability to recall a known word similar to an unfamiliar word, except for the initial or final consonant letter, and to correctly identify the unfamiliar word. These processes are the prerequisites listed by Gray for ability to employ consonant

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[40] Eleanor J. Gibson and others, "The Role of Grapheme-Phoneme Correspondence in the Perception of Words," American Journal of Psychology, LXXV (December, 1962), 554-70.

[41] Eleanor J. Gibson, Harry Osser, and Anne D. Pick, "A Study of the Development of Grapheme-Phoneme Correspondence," Journal of Verbal Learning and Verbal Behavior, II (August, 1963), 146.

[42] Henry P. Smith and Emerald V. Dechant, Psychology of Teaching Reading (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1961), p. 193.

[43] Richard L. Solomon and Leo Postman, "Frequency of Usage as a Determinant of Recognition Thresholds for Words," Journal of Experimental Psychology, XLIII (March, 1952), 195-201.

substitution.[44] The literature in the areas of reading and psychological research seems to indicate that (1) there is some relationship between specific word identification skills employing consonant substitution and reading achievement; (2) the use of more consistent sound-symbol relationships may assist in word identification; (3) people tend to generalize from previously-known words certain consistent predictions of sound-symbol correspondence and, therefore, are able to pronounce nonsense words that resemble English words of high spelling-to-sound correlation; and (4) previous frequency of past usage and familiarity assist in the identification of unknown words. However, the process of consonant substitution as proposed by Gray--the ability to recall a known word visually similar to an unfamiliar (simulated) word and the ability to identify (pronounce) correctly the same unfamiliar (simulated) word--has not been researched.[45]

Consonant substitution is one of the first word attack skills taught to children in many basal reader programs. The technique is used extensively in first and second grades to begin the development of independent word identification. Basal reader materials have a strong influence on adopted school procedures, and teachers continue to rely on them.[46] There has been an accumulation of research regarding the comparison of one reading approach with another but little research on the elements within a program. The present investigator agrees with Weintraub:

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[44] Gray, loc. cit. [45] Ibid.

> Unless there is analysis of the elements in a program that function to make one approach better than another, one cannot expect to move very far towards improving instruction. One direction needed in reading research is to identify the specific factors within a given program that prove successful and those that do not.[47]

Further research is needed to determine the most efficient ways of teaching children the spelling-to-sound correspondences found in the English language. Bishop's statement seems quite appropriate:

> It would be advantageous to test experimentally the transfer values of various methods of teaching these correspondences, and to determine the generality of this transfer for all children of a given age.[48]

Lack of scientific inquiry concerning the usefulness of the consonant substitution technique in word identification indicates necessity for investigation to determine its value in primary reading instruction.

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[46] Helen M. Robinson (ed.), Innovation and Change in Reading Instruction, Sixty-seventh Yearbook of the National Society for the Study of Education, Part II (Chicago: National Society for the Study of Education, 1968), p. 399.

[47] Samuel Weintraub, "Some Implications to Beginning Reading," The Reading Teacher, XXII (October, 1968), 63.

[48] Carol Bishop, "Transfer of Word and Letter Training in Reading," A Basic Research Program on Reading, Cooperative Research Project No. 639 (Ithaca, New York: Cornell University, 1963), p. 17.

In keeping with these suggestions for further research and because of the wide use of consonant substitution without adequate justification, this study was designed to test the effectiveness of consonant substitution among second-grade children comprising a random sample from designated schools who had been in a basal reading program incorporating the use of consonant substitution since the first grade. These children were asked individually to employ the technique. The resulting data were analyzed to determine whether there would be an association between recall of a known word and identification of an unknown word which was visually similar, except for the initial or final consonant. In addition, the relationship between the ability to employ both initial and final consonant substitution was determined as well as the effectiveness of both initial and final consonant substitution in regard to high, average, and low general reading achievement.

Assumptions

The following assumptions were made:

1. The consonant substitution technique, as outlined in the adopted basal reader series of the Columbia Public Schools, Columbia, Missouri, had been utilized in first and

second grade classrooms of designated schools used in the investigation.[49]

2. Second-grade children in designated Columbia Public Schools, having been exposed to one-and-a-half years of basal reading instruction, were familiar with consonant and vowel sounds and had a basic stock of sight vocabulary words from which to recall known words visually similar in form to simulated (unknown) words.

3. The twenty simulated words utilized in initial consonant substitution were independent of each other, as well as were the twenty simulated words utilized in final consonant substitution. This assumption was necessary so that an overall conclusion could be determined regarding the ability of second-grade children to employ initial and final consonant substitution.[50]

4. The process of identifying the simulated words involved similar mental processes to those used in identifying actual words.

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[49] Helen M. Robinson, Marion Monroe, and A. Sterl Artley, The New Basic Readers (Chicago: Scott, Foresman and Company, 1962).

[50] Henry E. Garrett, Statistics in Psychology and Education (New York: Longmans, Green and Company, 1958), p. 266.

Limitations of the Study

This study and the findings, conclusions, and generalizations drawn from it were limited by the following:

1. The final measuring instrument was constructed by the investigator as there were no valid measures published to assess consonant substitution. This instrument was derived through a pilot study, the children being chosen so that they were equally distributed among three levels of general reading achievement (high, average, and low). However, the final measuring instrument was used in the main investigation with children who were found to be significantly higher in general reading achievement than children in the pilot study from which the measure was derived. The findings of this study need to be interpreted accordingly.

2. The children selected for this study were specifically directed to employ the consonant substitution technique only and to verbalize known words visually similar to simulated words. The study was limited to the degree to which this was an artificial situation different from independent word identification involving the use of all word-attack skills in perceiving unfamiliar actual words.

3. This study was concerned with initial and final consonants in monosyllabic words to the exclusion of consonant blends and digraphs and multisyllabic words, which are also employed in the consonant substitution technique.

Therefore, results apply only to the identification of one-syllable simulated words containing single consonants in the initial and/or final positions.

4. Schools were selected, through advice from appropriate school authorities, according to representativeness of a cross-section of the population in the geographic area. Any generalizations will apply only to populations similar to the one which is described in this study.

Definitions of Terms

Second-grade children. Children who were in the second grade and who were in their second year of instruction in the Columbia Public Schools, Columbia, Missouri.

Sight word. A known word which is visually similar to a simulated word (except for the initial or final consonant letter or letters) and which is recalled (verbally pronounced) without use of analysis procedures.

Simulated word. An artificial one-syllable word constructed by the investigator, similar in form to a known word but which has no meaning and is not found in an English language dictionary.

Consonant substitution. The process involved in the identification (pronunciation) of a simulated word by:

1. substituting (replacing) the initial consonant or consonants in a known recalled word with a known consonant phoneme (*c*ake--*g*ake; *sh*ake--*g*ake).
2. substituting (replacing) the final consonant or consonants in a known recalled word with a known consonant phoneme (bea*t*--bea*g*; bea*ch*--bea*g*).
3. adding an initial consonant to a known recalled word (all--*d*all).
4. adding a final consonant to a known recalled word (see--see*g*).
5. omitting one of the phonemes of an initial consonant blend within a known recalled word (b*r*ain--bain).
6. omitting one of the phonemes of a final consonant blend within a known recalled word (lea*s*t--leat).

Initial consonant substitution. The process involved in the identification of a simulated word by recalling a known sight word visually similar to the same simulated word, except for the initial consonant or consonants (*c*ake--*g*ake; *sh*ake--*g*ake; all--*d*all; b*r*ain--bain).

Final consonant substitution. The process involved in the identification of a simulated word by recalling a known sight word visually similar to the same simulated word, except for the final consonant or consonants (bea*t*--bea*g*; see--see*g*; lea*s*t--leat).

Word identification. Correct pronunciation of a simulated word by substituting (replacing) the initial or final consonant or consonants in a known recalled word (sight word) with one known consonant phoneme.

General reading ability. The total reading achievement subtest score from the Metropolitan Achievement Tests, Primary II Battery, 1959, for second grade.

II. ORGANIZATION OF THE STUDY

This study is organized into five chapters and nine appendices.

Chapter I is an introductory chapter containing the problem, statement of the problem, importance of the study, assumptions, limitations of the study, definitions of terms, and the organization of the study.

Chapter II discusses the related literature in four sections: (1) studies involving the relationship between specific word identification skills employing consonant substitution and reading achievement; (2) studies in linguistics and reading regarding the association between more consistent sound-symbol relationships and word identification; (3) studies concerning the ability to transfer from known to unknown words; and (4) studies on the relationship between frequency of past usage, familiarity, and word identification.

Chapter III describes experimental procedures and materials outlining the method of treatment of the data.

Chapter IV is devoted to a discussion of treatment of the data and major findings of the study.

Chapter V summarizes the study and presents conclusions, recommendations, and implications.

This study also includes a selected bibliography and appendices.

III. SUMMARY

Consonant substitution is one of the first word attack skills taught to children during the beginning stages of word identification. Though the actual use of consonant substitution has not been studied, reading authorities and certain linguists have advocated the technique of word identification and incorporated the method into a number of reading programs. Also, certain reading authorities have expressed doubts regarding its value for disabled readers without justification based on research evidence. Because of need to determine the valuable elements within a program rather than comparing approach against approach in reading instruction, this study was conducted to glean some insight into the use of consonant substitution as one skill to employ in the identification of unknown words.

CHAPTER II

REVIEW OF RELATED LITERATURE

A review of literature relating to the utilization of consonant substitution in identifying unknown words is included in this chapter. Main sources of information used in this review included published research literature in reading from 1900 through 1966;[1] doctoral dissertations in reading from 1919 through 1965;[2, 3] textbooks published in the field of reading; and periodicals and dissertations related to reading from 1965 through May, 1969.

The technique of consonant substitution as such has not been researched; however, four areas in the literature were found to be related to the technique. The purpose of this chapter is to review these four related areas: (1) studies involving the relationship between specific word identification skills employing consonant substitution and reading achievement; (2) studies in linguistics and reading regarding the association between more consistent sound-symbol relationships and word identification; (3) studies concerning the ability to transfer from known to unknown words; and (4) studies on the relationship between frequency of past usage, familiarity, and word identification.

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[1] Edward G. Summers and others, Published Literature in Reading, 1900-1949 (Bloomington, Indiana: Indiana University, March, 1968), pp. 1-485; Edward G. Summers and others, Published Literature in Reading, 1950-1963 (Bloomington, Indiana: Indiana University, November, 1967), pp. 1-387; Edward G. Summers and others, Published Research Literature in Reading, 1964-1966 (Bloomington, Indiana: Indiana University, March, 1968), pp. 1-172.

[2] Leo C. Fay and others, Doctoral Studies in Reading 1919 through 1960 (Bloomington, Indiana: Indiana University, July, 1964), pp. 1-80.

[3] Edward G. Summers, Recent Doctoral Dissertation Research (Bloomington, Indiana: Indiana University, September, 1967), pp. 1-214.

I. WORD IDENTIFICATION SKILLS EMPLOYING CONSONANT SUBSTITUTION AND READING ACHIEVEMENT

Rudisill constructed one hundred forty-four nonsense words which differed from key words only in the initial or final consonant letter or letters and presented them to 315 third graders. Using total number of words pronounced correctly as a phonic knowledge score, she found that ability to substitute consonants from known words to identify nonsense words was significantly correlated with reading achievement (.71) and with spelling (.69). The correlation of .42 between phonic knowledge and mental age was significantly lower. Holding mental age constant, a partial correlation of .63 was obtained between reading achievement and phonic knowledge. Rudisill concluded that specific training rather than intelligence may result in common factors found between reading, spelling, and phonic knowledge.[4] The author stated:

> The obtained correlations support the hypothesis that the contribution of the study of phonics to achievement in reading and spelling is derived from the ability to identify sounds in normal word pronunciations and to relate these sounds to letter symbols. . . . The results of the present study strengthen the accumulating evidence that functional phonic knowledge makes a substantial contribution to achievement in reading and in spelling.[5]

The relationship of word element perception to sight vocabulary growth was investigated by Arkin and others.[6] Word element perception was taught under an intensive, systematic program of phonics by Durrell and Murphy[7] in addition to basal reader instruction using Scott, Foresman materials.[8] Three of five tests constructed specifically for the study involved use of consonant substitution: (1) phonogram identification, (2) relating sounds to letters, and (3) application of phonics. Correlations between each test and reading as measured by sight vocabulary at the end of five months were .79, .68, and .53, respectively. The authors concluded that word element perception was related to sight vocabulary growth among first graders.[9]

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[4] Mable Rudisill, "Interrelations of Functional Phonic Knowledge, Reading, Spelling, and Mental Age," Elementary School Journal, LVII (February, 1957), 264-67.

[5] Ibid., p. 267.

[6] Susan E. Arkin and others, "Growth Patterns in First Grade Reading" (unpublished Master's thesis, Boston University School of Education, 1964), pp. 1-174.

[7] D. D. Durrell and Helen A. Murphy, Speech-to-Print Phonics (New York: Harcourt, Brace and World, Inc., 1964), cited by Arkin and others, Ibid.

[8] Helen M. Robinson, Marion Monroe, and A. Sterl Artley, The New Basic Readers (Chicago: Scott, Foresman and Company, 1962), cited by Arkin and others, Ibid.

Murphy used the same approach as Arkin in studying word element perception among first graders. Results indicated a correlation of .66 between knowledge of phonograms and reading, as well as a correlation of .70 between the ability to identify sounds in words and reading as measured by an individual inventory of the vocabulary in Scott, Foresman readers. Controlling for mental age, Murphy found word perception to be highly related to reading achievement. Her results were similar to Arkin's results in that sight vocabulary growth seemed to be related to word element perception and to substitution.[10]

Hackney, in an extensive study of fourth grade students, attempted to determine which word identification skills normally taught in basal reading series contributed to reading achievement. He found the group with high reading achievement significantly superior to average and low groups on the eleven word identification skills presented. Each skill made a significant contribution to reading achievement. Six of these skills required children to employ consonant substitution techniques in differentiating between words of similar sound for identification: (1) beginning sounds (ten, men, pen); (2) whole words (walk, talk); (3) words within words (and, land); (4) speech consonants (cherry, sherry); (5) ending sounds (him, hit); and (6) rhyming sounds (some, come).[11]

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[9] Arkin and others, op. cit., pp. 161-63.

[10] Helen A. Murphy, "Growth in Perception of Word Elements in Three Types of Beginning Reading Instruction," The Reading Teacher, XIX (May, 1966), 585-89; 600.

To determine the relationship between performance on tests designed to measure word identification skills and reading comprehension, Benz and Rosemier discovered that fourth-grade children who scored high in reading comprehension were significantly superior to average and low groups on each of six word attack skills investigated. Computation of partial correlation coefficients between each of the six word attack skills and reading achievement revealed that words in context, rhyming sounds, and syllabication had high correlations with reading comprehension. Of these, rhyming sounds, which requires ability to employ consonant substitution, attained a partial correlation coefficient of .4793 with reading comprehension. The unique contribution of rhyming sounds to the variation in reading comprehension was 5.3 per cent. The authors concluded that results of the study seemed to indicate that certain skills could be identified as "most influential" in affecting reading comprehension at fourth-grade level. Therefore, good proficiency in these skills would be highly desirable and should be taught at lower grade levels.[12]

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[11] Ben H. Hackney, Jr., "Reading Achievement and Word Recognition Skills," The Reading Teacher, XXI (March, 1968), 515-18.

Blake, Aaron, and Westbrook[13] studied achievement in fifty selected basal reading skills by intellectually retarded, normal, and superior pupils who were taught for seven months in Scott, Foresman readers, grades two through five.[14] The fifty basal reading skills were divided into six categories, one of which was phonic analysis. Using degree of inclusiveness as a measure of complexity in analyzing levels one through six of the regular basals, the authors recognized that the skills could be listed in an expected hierarchical sequence. In the category of phonic analysis skills, "using spelling-patterns" (which requires the utilization of consonant substitution) was found to be the most complex of those skills evaluated. The percentage of contribution of each of four intellectual skills, identified as being related to basal reading skills, to the utilization of spelling-patterns by children was as follows: (1) associative memory, 0; (2) conceptualization, 14.74; (3) reasoning, 13.76; and (4) verbal meaning, 5.39. Significant linear trends in the use of spelling-patterns were revealed for superior, normal, and retarded children over all instructional levels. At both primary and intermediate grades, a comparison of normal and retarded groups equated on achievement and mental age in their ability to use spelling-patterns at the same instructional level indicated superiority for the normal group in level of acquisition. When normal and superior groups were equated on chronological age, a comparison of achievement in the use of spelling-patterns at the same instructional levels revealed a greater level of acquisition for superior readers for both primary and intermediate grades.[15]

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[12] Donald A. Benz and Robert A. Rosemier, "Word Analysis and Comprehension," The Reading Teacher, XXI (March, 1968), 558-63.

[13] Kathryn Blake, Ira E. Aaron, and Helen R. Westbrook, "Learning of Basal Reading Skills by Mentally Handicapped and Non-Mentally Handicapped Children," Journal of Research and Development in Education, II (Winter, 1969), 1-139.

[14] Robinson, Monroe, and Artley, loc. cit., cited by Blake, Aaron, and Westbrook, Ibid.

II. CONSISTENT SOUND-SYMBOL RELATIONSHIPS AND WORD IDENTIFICATION

Certain linguists have theorized that children should be able to proceed more rapidly in reading if initially introduced to words that are more-regular in sound-symbol correspondences. Bloomfield[16] was the first to advocate this idea, and Barnhart published Bloomfield's methodology for teaching reading.[17] These authors believed that children should be able to employ substitution techniques without guidance if only more-regular spellings in English were used as the approach to beginning reading instruction. Bloomfield stated:

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[15] Blake, Aaron, and Westbrook, _loc. cit._

> By getting all the facts together, the child's power to recognize words in his reading is greatly facilitated. After learning the first list or two, a child should be able to learn a whole list of words almost as rapidly as he learns one word now by the word method.[18]

Sofietti used a method similar to Bloomfield except for the inclusion of a writing component.[19] Hall also advocated introducing initial words on the basis of grouped grapheme-phoneme consistencies.[20] Fries recommended that children should practice on words grouped into spelling-patterns that are consistent within each group (*man*, *mane*, *mean*; *dan*, dane, dean).[21] All five linguists cited immediately above planned a gradual introduction to more complex sound-symbol relationships, measuring the difficulty of these relationships by consistency in sound-symbol correspondence.

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[16] Leonard Bloomfield, "Linguistics and Reading," *Elementary English Review*, XIX (April-May, 1942), 125-30; 183-86.

[17] Leonard Bloomfield and Clarence Barnhart, *Let's Read--A Linguistic Analysis* (Detroit: Wayne State University Press, 1961), p. 10.

[18] *Ibid*.

[19] James P. Sofietti, "Why Children Fail to Read: A Linguistic Analysis," *The Harvard Educational Review*, XXV (Spring, 1955), 79.

[20] Robert A. Hall, Jr., *Sound and Spelling in English* (New York: Chilton Books, 1961), p. 53.

Linguists have contributed recent knowledge regarding consistency of the English language. Hodges and Rudorf examined 17,000 words from the Lorge-Thorndike list and found that the great majority of English sounds were consistently represented in writing when factors such as accent, position in syllables, and simple relationships in one-syllable words were considered.[22] These authors stated:

> The orthography of American-English is determined by a set of rules for unit-grapheme relationships based, with decreasing productivity, upon three levels of analyses--phonological, morphological, and syntactical.[23]

Hodges and Rudorf concluded that regularities do exist and that the results of their study should be considered for possible use in initial reading programs.[24]

After tabulating consistency in approximately 20,000 English words from the Lorge-Thorndike word list, Weir and Venezky contended that English spelling not only relates to phonology (use of simple letter-to-sound relationships), but also to morphology (use of meaningful graphemic units) and to syntax (use of the position of words in phrases and in sentences). When English is viewed with this understanding, regularity of the English language increases; for example, (ball, call, fall, small, stall, etc.) would be consistent on a morphophonemic level. Weir and Venezky concluded that a much higher degree of regularity could be shown if written words were viewed as a morphophonemic system rather than a simple letter-to-sound relationship. They recommended that words should be presented which have high transfer value to reading other words, and that their findings should be considered in the development of reading materials.[25]

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[21] Charles C. Fries, Linguistics and Reading (New York: Holt, Rinehart and Winston, Inc., 1963), p. 204.

[22] Richard E. Hodges and E. Hugh Rudorf, "Searching Linguistics for Cues for the Teaching of Spelling," Elementary English, XLII (May, 1965), 527-33.

[23] Ibid., p. 531. [24] Ibid., p. 533.

More recently, Venezky presented and organized sets of orthographic patterns for incorporation into the teaching of reading. He proposed a plan to pattern the more consistent sound-symbol relationships from initial stages rather than several linguists' ideas (Bloomfield, Barnhart, Sofietti, Hall, and Fries) of beginning only with the direct spelling-to-sound approach.[26] Venezky emphasized:

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[25] Ruth H. Weir and Richard L. Venezky, Rules to Aid in the Teaching of Reading, Research Project No. 2584, (Stanford, California: Stanford University, 1965), pp. 3, 27, 49-50.

[26] Richard L. Venezky, "English Orthography: Its Graphical Structure and Its Relation to Sound," Reading Research Quarterly, II (Spring, 1967), 75-102.

> The potential generalization derived from the differentiation approach, however, certainly is greater than that from a simple-sequence method.[27]

Venezky further reported that English orthography has developed an extensive set of relational units (graphemic strings) as well as an extensive marking system (how to predict the pronunciation of words from graphemic structure) which is seldom given deserved attention in reading. Venezky further maintained that children should be taught to search for clues.[28]

The present investigator believes that the studies by Hodges and Rudorf, and Weir and Venezky, cited immediately above, have implications for research which has been conducted regarding the effect of more consistent sound-symbol relationships and word identification. Consonant substitution is employed not only with words that have a one-to-one relationship between sound and symbol (cat, rat), but also with words that are considered regular on a morphophonemic level (call, fall, ball). The majority of research has been conducted on modified versions of the Bloomfield method, as well as some research on the Fries method. None of the investigations reported in this section of the present study used only words which have a one-to-one relationship between sound and symbol.

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[27] *Ibid.*, p. 103.

[28] R. L. Venezky, "Reading: Grapheme-Phoneme Relationships," *Education*, LXXXVII (May, 1967), 519-24.

Bloomfield's theory appears to have received more complete investigation. Daniels and Diack, with Bloomfield's material, supported the use of consistent sound-symbol relationships in teaching speech sounds functionally, not in isolation.[29] Bloomer found that pupils using Bloomfield-type materials scored significantly higher than basal groups in word recognition and sentence reading subtests; however, no significant differences were found in paragraph reading.[30] Without statistical evidence, findings from the three-year Goldberg and Rasmussen[31] study indicated that, under completely individualized instruction, some of the children "learned to read in a remarkably short time."[32] Using thirteen seventh and eighth graders, Wilson and Lindsay found the Bloomfield system favorable for disabled readers.[33] Davis, in a three-year project at the University of Wisconsin, also reported positive results in favor of more regular sound-symbol relationships in initial reading; pupils using the linguistic materials scored significantly higher in word recognition than pupils using basal materials only.[34] Sister Mary Edward Dolan, using a severely modified version of Bloomfield's system, reported fourth-grade pupils significantly superior in word recognition as compared to pupils in regular basal materials; this superiority diminished in more complex skills.[35]

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[29] J. C. Daniels and Hunter Diack, "The Phonic Word Method," The Reading Teacher, XIII (October, 1959), 14-21.

[30] Richard H. Bloomer, "An Investigation of an Experimental First Grade Phonics Program," Journal of Educational Research, LIII (January, 1960), 188-93.

[31] Lynn Goldberg and Donald Rasmussen, "The Use of Linguistics in the Beginning Reading Program of the Miquon School," Elementary English, XL (March, 1963), 242-47, 254.

[32] Ibid., p. 247.

The most extensive study among various approaches to first-grade reading instruction was conducted in 1964 and 1965. Bond and Dykstra compiled the data from twenty-seven individual studies comprising the Cooperative Research Program in First-Grade Reading Instruction financed by the United States Office of Education. Each study was individual; however, common tests were employed and results were sent to the Coordinating Center at the University of

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[33] R. G. Wilson and H. G. Lindsay, "Applying Linguistics to Remedial Reading," The Reading Teacher, XVI (May, 1963), 452-55.

[34] David C. Davis, "Phonemic Structural Approach to Initial Reading Instruction," Elementary English, XLI (March, 1964), 218-23.

[35] Sister Mary Edward Dolan, P.B.V.M., "Effects of a Modified Linguistic Word Recognition Program on Fourth-Grade Reading Achievement," Reading Research Quarterly, I (Summer, 1966), 37-66.

Minnesota so that analyses could be made across individual projects.[36] One of these studies was conducted with use of the Bloomfield system. Sheldon and Lashinger compared the Bloomfield system to basal programs and discovered no significant differences in word identification of the two groups; however, the group receiving greater consistency in sound-symbol relationships tended to have higher scores than the traditional basal group in word identification.[37] Extension of the same study into second and third grades revealed no significant differences among programs in word identification nor in comprehension.[38]

Wilson developed a reading program based on Fries' principles. Encouraged by the success of her experimental classes for two years, she planned to expand her program.[39] Another first-grade study from the cooperative research project used Fries' approach with basal materials.[40] Schneyer compared the Fries' basal system with traditional basal readers for three years. He reported no significant differences between groups in word identification skills; however, there was a tendency for the group using Fries' system to have higher scores than the traditional basal group in word identification.[41]

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[36] Guy L. Bond and Robert Dykstra, "The Cooperative Research Program in First-Grade Reading Instruction," Reading Research Quarterly, II (Summer, 1967), 7.

[37] William D. Sheldon and Donald R. Lashinger, "Effect of First Grade Instruction Using Basal Readers, Modified Linguistic Materials, and Linguistic Readers," The Reading Teacher, XIX (May, 1966), 576-79.

[38] William D. Sheldon, Nancy J. Nichols, and Donald R. Lashinger, "Effect of First Grade Instruction Using Basal Readers, Modified Linguistic Materials, and Linguistic Readers--Extended into Second Grade," The Reading Teacher, XX (May, 1967), 720-25; W. D. Sheldon, Franga Stinson, and James D. Peebles, "Comparison of Three Methods of Reading: A Continuation Study in the Third Grade," The Reading Teacher, XXII (May, 1969), 539-46.

Ruddell investigated four programs with varying emphases placed on regularity of phoneme-grapheme correspondence in first and second grades. He discovered that programs (1) making provision for a high degree of consistency in the vocabulary introduced, and (2) placing special emphasis on language structure, as related to meaning, were significantly higher in word meaning, and regular and irregular word identification. Consistency alone did not produce significant differences.[42] Bond and Dykstra, in summarizing the studies by Sheldon, Schneyer, and Ruddell comparing linguistic versus basal reading programs, observed that the linguistic group which presented words more regular in correspondence tended to be superior in word recognition, although no significant differences were found.[43]

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[39] Rosemary Green Wilson, "A Linguistic Approach to Beginning Reading Based Upon Fries' Principles," Improvement of Reading through Classroom Practice, Proceedings of the International Reading Association, IX (1964), 225-27.

[40] Bond and Dykstra, op. cit., p. 78.

[41] J. Wesley Schneyer, "Reading Achievement of First Grade Children Taught by a Linguistic Approach and a Basal Reader Approach," The Reading Teacher, XIX (May, 1966), 647-52; J. W. Schneyer, "Reading Achievement of First Grade Children Taught by a Linguistic Approach and a Basal Reader Approach--Extended into Second Grade," The Reading Teacher, XX (May, 1967), 704-10; J. W. Schneyer, "Reading Achievement of First Grade Children Taught by a Linguistic Approach and a Basal Reader Approach--Extended into Third Grade," The Reading Teacher, XXII (January, 1969), 315-19.

Four additional studies within the first grade research program, in addition to the three linguistic studies cited immediately above, revealed that children who received instruction with words having greater consistency in the introduction of sound-symbol correspondences in early reading instruction were superior in word recognition abilities:[44] Investigations conducted by Hayes, Hahn, Tanyzer and Alpert, and Wyatt compared traditional basal programs that introduce words of high utility, to programs having a more regular introduction to sound-symbol correspondences. Findings from all four studies revealed significant differences in word recognition abilities (the identification of regular and irregular words) favoring the programs introducing words with more consistent sound-symbol relationships.[45, 46, 47, 48]

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[42] Robert B. Ruddell, "Reading Instruction in First Grade with Varying Emphasis on the Regularity of Grapheme-Phoneme Correspondences and the Relation of Language Structure to Meaning," The Reading Teacher, XIX (May, 1966), 653-60; R. B. Ruddell, "Reading Instruction in First Grade with Varying Emphasis on the Regularity of Grapheme-Phoneme Correspondences and the Relation of Language Structure to Meaning--Extended into Second Grade," The Reading Teacher XX (May, 1967), 730-39.

[43] Bond and Dykstra, *op. cit.*, p. 38.

[44] *Ibid.*, pp. 49-61.

Bond and Dykstra, after compiling the data from each individual project, conducted analyses across individual projects.[49] The following results from cross-analyses lend support to the value of greater consistency in the introduction of sound-symbol correspondence: (1) correlational relationships determined in studies concerning word identification indicated that children who had the ability to read

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[45] Robert B. Hayes, "ITA and Three Other Approaches to Reading in First Grade," The Reading Teacher, XIX (May, 1966), 627-30; R. B. Hayes and Richard C. Wuest, "ITA and Three Other Approaches to Reading in First Grade--Extended into Second Grade," The Reading Teacher, XX (May, 1967), 694-97, 703; R. B. Hayes and R. C. Wuest, "A Three Year Look at ITA, Lippincott, Phonics and Word Power, and Scott, Foresman," The Reading Teacher, XXII (January, 1969), 363-70.

[46] Harry T. Hahn, "Three Approaches to Beginning Reading Instruction," The Reading Teacher, XIX (May, 1966), 590-94.

[47] Harold J. Tanyzer and Harvey Alpert, "Three Different Basal Reading Systems and First Grade Reading Achievement," The Reading Teacher, XIX (May, 1966), 636-42.

[48] Nita M. Wyatt, "The Reading Achievement of First-Grade Boys versus First-Grade Girls," The Reading Teacher, XIX (May, 1966), 661-65.

[49] Bond and Dykstra, op. cit., p. 7.

phonetically-regular words also had the ability to read words of high utility even though irregular;[50] and (2) programs employing greater vocabulary control on sound-symbol regularity, introducing a relatively larger reading vocabulary, and emphasizing writing symbols as a means of learning them, were significantly superior in word identification skills. Bond and Dykstra stated:

> Indications are that the initial reading vocabulary should be selected with greater balance between phonetically regular words and high utility words. Introducing words solely on the basis of frequency of use presents an unusually complex decoding task for the beginning reader--yet--strictly using phonetically regular words makes it difficult to write meaningful material.[51]

These authors concluded by asserting that research is needed to determine which one of the three elements is primarily responsible for the effectiveness of various reading approaches: (1) vocabulary control on sound-symbol regularity; (2) introduction of a relatively larger vocabulary; or (3) emphasis on writing.[52]

III. ABILITY TO TRANSFER FROM KNOWN TO UNKNOWN WORDS

In studying the reading process in laboratory situations, Gibson and her associates investigated the most appropriate unit for word identification which seemed to yield the highest transfer to unknown words. They found the proper unit for pronouncing nonsense words was a "cluster" of letters that resembled ordinary English spelling-patterns. Subjects could pronounce nonsense words that looked like an English word to a significantly greater degree than nonsense words which contained the same letters but were not in ordinary English patterns (nar and lar were easier to pronounce than nra and lra).[53] The present investigator believes that consonant substitution requires the ability to generalize to the pronunciation of new words certain consistent predictions of English sound-symbol correspondences learned from previous experience.

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[50] *Ibid.*, p. 119. [51] *Ibid.*, p. 124.

[52] *Ibid.*, pp. 123-24.

In the first investigation, Gibson and others studied the ability of college students to recognize a constructed set of pseudo-words, some of which kept English spelling-patterns and some of which did not. The pseudo-words were matched for summed-letter frequency (drighk-kighdr), and words were presented tachistoscopically. The investigators revealed that subjects recognized, reproduced, and pronounced pseudo-words that retain English spellings to a significantly greater degree. They also found a correlation of .85 between pronunciability and pronunciation of pseudo-words that kept English patterns intact. These investigators concluded that the ability to recognize pseudo-words had been facilitated by long exposure to sound-symbol correspondences in the English language. The ability to pronounce pseudo-words seemed to be inferred from real words already encountered and, therefore, transferred to the recognition of new words irrespective of meaning.[54]

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[53] Eleanor J. Gibson and others, "The Role of Grapheme-Phoneme Correspondence in the Perception of Words," American Journal of Psychology, LXXV (December, 1962), 554-70.

To determine if primary grade children could employ the same process, Gibson, Osser, and Pick investigated the relationship between first and third graders' ability to pronounce a list of pseudo-words that had the same summed-letter frequency as real words (can, nac, nca). Findings indicated that both first and third graders were able to identify pseudo-words which retained English spelling-patterns. The researchers also discovered that third graders were able to pronounce a significantly greater number of pseudo-words, and concluded that children in the early stages of reading had already generalized certain consistent predictions of sound-symbol correspondence which correlated with words they already knew. The investigators stated:

> Even though a child is presented with "whole words" and encouraged to associate the printed word as a whole with the spoken word, he still begins to perceive some regularities of correspondence between the printed and

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[54] *Ibid.*

> written terms and transfers these to the reading of unfamiliar words.[55]

The authors believed that this generalizing process promoted reading efficiency and could be facilitated by presenting materials in such a way as to enhance regularities and to speed up incorporation.[56]

The last investigation completed by Gibson and her associates was designed to determine whether meaningful trigram units were easier to pronounce than units which resembled English spelling. They constructed sets of trigrams matched for summed-letter frequency: (1) KOR--pronounceable; (2) RKO--meaningful; and (3) OKR--control. They requested college students to pronounce them. Findings revealed that the pronounceable trigrams (the ones that resembled English spelling) were easier to recognize; however, retention seemed better for the meaningful trigrams. These authors concluded that pronunciability was most helpful in structuring letters into a single word, and meaningfulness provided a category for grouping.[57]

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[55] Eleanor J. Gibson, Harry Osser, and Ann D. Pick, "A Study of the Development of Grapheme-Phoneme Correspondences," Journal of Verbal Learning and Verbal Behavior, II (August, 1963), 146.

[56] Ibid., pp. 142-46.

[57] E. J. Gibson and others, "Comparison of Meaningfulness and Pronunciability as Grouping Principles in the Perception and Retention of Verbal Material," Journal of Experimental Psychology, LXVII (February, 1964), 173-82.

Williams and Derks, with consonant-vowel-consonant trigrams differing in pronunciability and association value, also found that, by increasing pronunciability, college students' word recognition increased. They reported that acquisition of visually presented material seemed to depend largely on its pronunciability.[58]

Levin and Biemiller, in three studies of oral reading, investigated the formation of "clusters" of letters. In the first study, two lists of words were constructed (eight real and eight pseudo) and presented to fifty-four second, third, and fourth graders to read aloud. Findings revealed that children pronounced real words more quickly than pseudo-words; that there was faster recognition as grade level increased; and that recognition was faster on the second trial. Interestingly, the difference in recognizing real and pseudo-words occurred only for words correctly read. If the child made an error, his response was equally slow for both types of words unless the pseudo-word contained a familiar English sound pattern (and in gand); if it did, then recognition was easier.[59] In conclusion Levin and

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[58] John M. Williams and Peter L. Derks, "Mode Presentation and the Acquisition of Paired Associates that Differ in Pronunciability and Association Value," Journal of Verbal Learning and Verbal Behavior, II (December, 1963), 453-56.

[59] Harry Levin and Andrew J. Biemiller, Words versus Pseudo-Words. Studies in Oral Reading, I. Mimeo. (Ithaca, New York: Cornell University, 1965), pp. 1-19.

Biemiller made inferences regarding the reading process:

> The process leading to the word read aloud, as we see it now, goes something like this. The child decodes the word into an auditory equivalent (forms an "auditory image"). He checks this image against his auditory memory of words he knows or sound patterns that he is familiar with. The closer the match, the more quickly he says the word. Unfamiliar sound patterns may increase latency by leading to further decoding, rehearsal, matching, or confusion.[60]

In the second study, Levin and Biemiller presented pseudo-words of varying pronunciability to thirty-six third and fourth graders. The authors discovered that the harder a word was to pronounce, the longer was the interval from word presentation to verbal response. This held true with word length controlled. Levin and Biemiller believed that this finding seemed to confirm their interpretation of the reading process--that the decoded sound is matched against an auditory image and rehearsed against a background of experience of acceptable sounds for the person.[61]

Levin and Biemiller, in the third study, asked second, third, and fourth graders to read aloud three types of words: (1) words beginning with initial consonants c, g, and k in their less common pronunciation (celt, gym, knit); (2) the same initial consonants in their more frequent pronunciations (colt, get, kind); and (3) words having the same ending letters but with an invariant initial consonant that did not depend on its environment within the word (belt, bet, bit). They found that children took a longer period of time to read the words having the less common pronunciation of the initial consonant (celt); other types were comparable.[62] In conclusion, Levin and Biemiller stated:

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[60] Ibid., pp. 11-12.

[61] Andrew J. Biemiller and Harry Levin, Pronunciability. Studies in Oral Reading, II. (Ithaca, New York: Cornell University, 1965), pp. 1-10.

> As a matter of fact, the most conservative interpretation is that these children are responding to a single pattern which they had learned (the common one) and were having difficulty with the patterns which they had little experience.[63]

IV. FREQUENCY OF PAST USAGE, FAMILIARITY AND WORD IDENTIFICATION

Consonant substitution demands the ability to recall a known word to assist in the pronunciation of an unknown word. Therefore, frequency of past usage and familiarity with words should play a role in effective word identification when the technique of consonant substitution is utilized. Postman has been a leader in investigations based on the relationship between frequency of prior usage and word identification among college students.

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[62] Andrew J. Biemiller and Harry Levin, *Contingent versus Non-Contingent Spelling Patterns*. *Studies in Oral Reading, III. Preliminary Draft*. (Ithaca, New York: Cornell University, 1966), pp. 1-20.

[63] *Ibid.*, p. 8.

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In 1952, Solomon and Postman studied the relationship between word recognition and frequency of prior usage. College students were requested to pronounce different nonsense words with frequency controlled experimentally. Findings revealed that frequency of prior usage was closely related to word recognition.[64]

To determine if frequency of prior usage or frequency of occurrence (frequency counts in English) was the significant element in easier word recognition, Solomon and Conger, in 1954, conducted two experiments. In the first experiment, undergraduates were presented with three-letter English words, some of which were based on frequency of prior usage and some on frequency of occurrence in English. Solomon and Conger reported that trigrams based on frequency of prior usage were significantly easier to pronounce. The relationship between word recognition and the trigrams based on frequency counts was .09. Solomon and Conger concluded: "Our results point to the importance of 'verbal habits' as determiners of the speed of recognition of letter sequences."[65] In the second experiment, the investigators controlled frequency of prior usage and presented nonsense trigrams varying in frequency of occurrence in English to undergraduate students. Again, the relationship between word recognition and frequency of occurrence in the English language was low (r = .10). No effects of sheer frequency of occurrence were found.[66]

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[64] Richard L. Solomon and Leo Postman, "Frequency of Usage as a Determinant of Recognition Thresholds for Words," Journal of Experimental Psychology, XLIII (March, 1952), 195-201.

In 1956, Postman and Rosenzweig, in another experiment regarding the effect of frequency of prior usage on word recognition, disclosed that undergraduates could pronounce nonsense syllables just as easily as real English words when frequency of prior usage was equivalent, and that a subject would complete partially discriminated stimuli in terms of past usage.[67] Major conclusions that Postman and his associates repeated throughout their studies were: (1) word recognition is influenced by verbal habits of the past; (2) speed of recognition depends on the frequency with which the word has been used in the past; (3) the more familiar the word, the more redundant the stimulus pattern;

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[65] Leo Postman and Beverly Conger, "Verbal Habits and the Visual Recognition of Words," Science, CXIX (May 14, 1954), 672.

[66] Ibid., pp. 671-73.

[67] Leo Postman and M. R. Rosenzweig, "Practice and Transfer in the Visual and Auditory Recognition of Verbal Stimuli," American Journal of Psychology, LXIX (June, 1956), 209-26.

and (4) redundancy facilitates learning. Recommendation for improvement in word recognition was through strengthening and differentiation of verbal habits.[68]

In a later study regarding the relationship between frequency of past usage and word recognition, Taylor, Rosenfeldt, and Schulz used a forced-choice technique to control for response bias (minimize guessing). Using undergraduates, the investigators found that frequency of prior usage was significantly related to word recognition even when response bias was controlled.[69]

Other researchers have reported a relationship between familiarity and word recognition. In a study by Wiley of first graders' ability to learn new words, the relationship determined between word recognition and familiarity was .55 ± .06.[70] Wiley, in concluding that ease of learning seemed to be related to familiarity, remarked:

> . . . the meaning which a word has for a first grade child is a factor which will greatly influence

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[68] Leo Postman and M. R. Rosenzweig, "Perceptual Recognition of Words," Journal of Speech and Hearing Disorders, XXII (June, 1957), 245-53.

[69] Janet A. Taylor, Doris C. Rosenfeldt, and Rudolph W. Schulz, "The Relationship Between Word Frequency and Perceptibility with a Forced-Choice Technique," Journal of Abnormal and Social Psychology, LXII (May, 1961), 491-96.

[70] Will E. Wiley, "Difficult Words for the Beginner," Journal of Educational Research, XVII (April, 1928), 278-89.

> the difficulty he may have in learning to recognize the word symbol.[71]

Payne administered twelve lists of familiar and unfamiliar words to four hundred children in grades two through five. He observed from an analysis of errors that when a child is confronted with an unknown word, he tends to call it a word in his sight vocabulary which is most like it in sound and appearance.[72]

In a study with college students, Chapman and Gilbert taught Hindustani words (unknown words) by associating them with familiar and unfamiliar English words. It was discovered that college students learned Hindustani words much more rapidly when they were associated with familiar English words.[73]

Using pseudo-words constructed at different orders of approximation to English, Miller, Bruner, and Postman investigated the relationship between word recognition and familiarity of letter sequences among college students.

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[71] Ibid., p. 285.

[72] Cassie Spencer Payne, "The Classification of Errors in Oral Reading," Elementary School Journal, XXXI (October, 1930), 142-46.

[73] Florence L. Chapman and Luther C. Gilbert, "A Study of the Influence of Familiarity with English Words Upon the Learning of Their Foreign Language Equivalents," Journal of Educational Psychology, XXVIII (November, 1937), 621-28.

All pseudo-words were eight letters in length.[74] The investigators reported that "the number of letters identified correctly increases when the stimulus sequence provides a context familiar to the observer."[75]

Tulving and Gold also investigated the relationship between the amount of information and word perception. The experiment was repeated three times: (1) with graduate students in psychology; (2) with undergraduate students and (3) with only female students in college. A high correlation was found between the amount of information and ease of word recognition.[76] However, one observation noted was that:

> . . . it is not just the amount of information in the context that determines the ease of tachistoscopic recognition of the target word, but rather the amount of "relevant information."[77]

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[74] George A. Miller, Jerome S. Bruner, and Leo Postman, "Familiarity of Letter Sequences and Tachistoscopic Identification," Journal of General Psychology, L (January, 1954), 129-39.

[75] Ibid., p. 139.

[76] Endel Tulving and Cecille Gold, "Stimulus Information and Contextual Information as Determinants of Tachistoscopic Recognition of Words," Journal of Experimental Psychology, LXVI (October, 1963), 319-27.

[77] Ibid., p. 326.

V. SUMMARY

A review of related literature seems to indicate that specific word recognition skills which employ the consonant substitution technique have a high relationship with reading achievement. There is also evidence that children who are exposed to words of greater consistency in sound-symbol relationships appear to have superior word recognition abilities. There are indications that children and adults tend to generalize from previously known words certain consistent predictions of sound-symbol correspondences in English and, therefore, are able to pronounce pseudo-words that resemble English words. Word recognition seems to be enhanced by frequency of past usage and familiarity with words.

The present investigator believes that the consonant substitution technique is employed with words of more consistent sound-symbol correspondences and depends on the ability of children to recall known words and to generalize this association to assist in correct pronunciations of unknown words. Though inferences have been made regarding the ability of children to refer to known words as aids to the correct identification of unknown words, and specific skills which employ consonant substitution techniques have been found to have a high correlation with reading achievement, the process of consonant substitution has not been investigated objectively.

CHAPTER III

PROCEDURES USED IN THE STUDY

According to Gray, the process of initial and final consonant substitution demands four abilities: (1) ability to recall from memory the form of a known word; (2) ability to note similarity in form between the known and unfamiliar word; (3) ability to associate sound with a few consonant letters; and (4) ability to blend an initial or final consonant sound with the remaining sounds in a word and to identify the unfamiliar word. The purpose of this chapter is to discuss the procedures utilized to investigate this process proposed by Gray--the ability to recall a known word that is visually similar to an unknown word (except for the initial or final consonant) and the ability to pronounce correctly the unknown word by the substitution process.[1]

I. DEVELOPMENT OF THE PRELIMINARY MEASURING INSTRUMENT AND A MEASURE OF CONSONANT PHONEME KNOWLEDGE

Construction of the Preliminary Measuring Instrument

The investigator constructed a preliminary measuring instrument of eighty-four one-syllable simulated words from which a final measuring instrument of forty-four simulated words was derived to investigate the process of initial and final consonant substitution. Simulated words were constructed to insure that all words involved in the process would be unknown. The simulated words were restricted to those of one syllable to investigate the effectiveness of the first word attack skill advocated by Gray.[2] These simulated words were constructed by the following procedure:

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[1] William S. Gray, On Their Own in Reading (revised edition; Chicago: Scott, Foresman and Company, 1960), p. 78.

1. All English one-syllable words employed in teaching both initial and final consonant substitution from the teachers' guidebooks (second-preprimer through the first half of level two) of the basal reading series adopted by the Columbia Public Schools and the University Laboratory School, Columbia, Missouri, were used by the investigator to determine the most frequently used phonograms (groups of letters) utilized in initial and final consonant substitution exercises in basal readers and workbooks.[3]

2. All English one-syllable words containing a phonogram in the initial position (e.g., ca--, bea--) or in the final position (e.g., --ide, --at) were recorded and the frequency tabulated from Bartschi and Stone's list of words

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[2] Ibid., p. 66.

[3] Helen M. Robinson, Marion Monroe, and A. Sterl Artley, The New Basic Readers (Chicago: Scott, Foresman and Company, 1962).

most frequently encountered in the preprimer through the first half of level two vocabularies from five of the most widely used basal reading series.[4]

3. The frequencies of the phonograms from the adopted basal reading series of the school district and the Bartschi and Stone list (cited in numbers one and two, respectively) were summed for both initial and final consonant substitution. The eighty-four most frequently used phonograms from English one-syllable words were then selected for use in constructing simulated words for the main study (forty for initial consonant substitution and forty for final consonant substitution with two sample words for each technique). Tables I and II, pages 123 and 124, Appendix A, show the frequency tabulation for each phonogram used in constructing simulated words for each consonant substitution technique.

4. The most frequently used consonants were identified from the same English one-syllable words in which phonograms were determined for both initial consonant substitution and final consonant substitution. The arbitrary criterion for selection was that the consonants must have appeared at least twenty or more times in the initial

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[4] David R. Stone and Vilda Bartschi, "A Basic Word List from Basal Readers," Elementary English, XL (April, 1963), 420-27.

or final position of the English words. The frequency for each consonant used in constructing simulated words for initial and final consonant substitution is to be found in Tables III and IV, respectively, pages 125 and 126, Appendix A.

5. The forty-two simulated words for initial consonant substitution and the forty-two simulated words for final consonant substitution were constructed by determining which one of the most frequently used consonants, when combined with an initial or final phonogram, would make a word that was not found in the English language. Effort was made to use each consonant an equal number of times. Table V, page 127, Appendix A, shows consonant usage in formulating the simulated words. The constructed one-syllable words for initial consonant substitution contained one initial consonant in the initial position combined with a final phonogram (e.g., bain, hing, tay, nide). The constructed one-syllable simulated words for final consonant substitution contained one final consonant in the final position combined with an initial phonogram (e.g., feem, mak, worg, ean).

All constructed one-syllable simulated words were checked in the dictionary to verify that the words were not part of the English language.[5] The acceptable pronunciation for each simulated word was determined from the most frequent way the phonogram was pronounced in English words utilized in consonant substitution exercises in the adopted basal reading series or listed in Bartschi and Stone's basic word list from basal readers.[6, 7] The simulated words with the acceptable pronunciation for each word are listed in Appendix A, pages 128 and 129, for initial and final consonant substitution, respectively.

Words on the preliminary measuring instrument were arranged by the following procedure: The eighty-four simulated words were alphabetized separately for each consonant substitution technique, numbered consecutively, and then placed in random order by referral to a table of random numbers so that no child would be responding consistently to the same procedure (initial or final consonant substitution).[8] The first four simulated words selected by the random procedure cited immediately above were designated as sample words (two for initial consonant substitution and two for final consonant substitution). The preliminary measuring instrument and the recording form on which the children's responses were recorded are located in Appendix B, pages 131 and 132.

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[5] Webster's Seventh New Collegiate Dictionary (Springfield, Massachusetts: G. C. Merriam Company, 1965).

[6] Robinson, Monroe, and Artley, loc. cit.

[7] Bartschi and Stone, loc. cit.

[8] The RAND Corporation, A Million Random Digits with 100,000 Normal Deviates (Glencoe, Illinois: The Free Press, Publishers, 1955), pp. 1-400.

Construction of the Measure of Consonant Phoneme Knowledge

In order to determine if the subjects who participated in the study were familiar with consonant sounds used in the initial and final positions of simulated words, a measure was devised to ascertain consonant phoneme knowledge. Knowledge of consonant sounds was the third ability Gray believed to be necessary to employ consonant substitution.[9] The measure was constructed so that consonant phoneme knowledge could be reported; no data from this measure were involved in the main study.

Pictures from the workbooks of the preprimers, primer, junior primer, and pictionary of the Scott, Foresman series were selected so that each picture represented one consonant phoneme employed in the initial or final position of simulated words.[10] One sheet of pictures was devised for each consonant substitution technique. Four sample pictures (two for each technique) were used to insure understanding of the procedures before administering the measure. Three consonants were placed below each picture. Every child had a choice of one among the three consonants which formed the initial or final consonant phoneme for the picture-word. The consonants that were included as alternatives were dissimilar in form so that confusion among letters was held to a minimum. The measure for consonant phoneme knowledge is located in Appendix C, page 137. The sheets for initial and for final consonant phoneme pictures were photostatically reduced 17 per cent and 12 per cent, respectively, so that each could be placed on a single page.

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[9] *Cf.*, p. 55.

II. THE PILOT STUDY

A pilot study was conducted with twenty-one second graders, who were selected by the investigator so that they were equally divided among three levels of general reading achievement (high, average, and low). This pilot study was conducted to derive the final measuring instrument of forty-four simulated words from a preliminary measuring instrument of eighty-four constructed simulated words. The final measuring instrument was to be used in the main study. The plan was to develop an instrument that would contain simulated words representing a range of difficulty for the children within each of the three reading levels cited immediately above. In order to do this it was necessary to discard all simulated words which were identified either correctly or incorrectly by all the children within each reading level.

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[10] Helen M. Robinson, Marion Monroe, and A. S. Artley, Think-and-Do Book for use with The Three Pre-Primers, The New Basic Readers (Chicago: Scott, Foresman and Company, 1962), pp. 2, 29, 34, 43, 49, 55, 59, 63; H. M. Robinson and others, Think-and-Do Book for use with Fun With Our Friends, Primer, The New Basic Readers (Chicago: Scott, Foresman and Company, 1962), pp. 8, 13, 14, 19, 67; H. M. Robinson, Marion Monroe, and A. S. Artley, Think-and-Do Book for use with The New Guess Who, Junior Primer, The New Basic Readers (Chicago: Scott, Foresman and Company, 1962), p. 16; Marion Monroe and W. Cabell Greet, My Second Pictionary (Chicago: Scott, Foresman and Company, 1964), p. 107.

Selection of Subjects

Children in the second grade of the University Laboratory School, Columbia, Missouri, were selected as subjects for the pilot study. Second-grade children, who had either attended the Columbia Public Schools or the University Laboratory School during their first year of school and were presently completing the first half of second grade in the University Laboratory School, were chosen to participate for the following reasons:

1. Second-grade children usually have acquired an adequate sight vocabulary from which to recall known words.

2. Exercises in consonant substitution were found to be listed as part of phonic analysis procedures in the teachers' guidebooks of the adopted basal reading series of the school district.[11] Examination of these guidebooks revealed that the teaching of both initial and final consonant substitution was included to the largest extent in the regular basals and workbooks from the second-preprimer through the first half of level two. Since the majority of exercises involving consonant substitution were included in the basal readers during grade one and the first half of grade two, children enrolled in the latter half of second grade were chosen for participation in the study. In order to assume that the selected children were exposed to the consonant substitution technique, it was necessary to require that the first year-and-a-half of instruction was in the Columbia Public Schools or the University Laboratory School where basal readers were used that included the teaching of consonant substitution.

Twenty-one second-grade children were chosen for participation in the pilot study according to their stanine scores on the reading achievement subtest of the Metropolitan

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[11] Robinson, Monroe, and Artley, The New Basic Readers, loc. cit.

Achievement Tests.[12] The reading subtest measures ability to comprehend sentences as well as material of paragraph length.[13] The test was administered by the investigator, and stanine scores were recorded rather than grade equivalents because of the test authors' recommendation.[14] The procedure cited above was followed so that there would be at least seven second-grade pupils within each reading level (high, average, and low) and at least two children within each stanine score. The children would represent various levels of reading achievement so that the measuring instrument for the main study could be derived from a group of subjects with equal representation at all levels of general reading achievement. The following tabulation indicates the reading level for the twenty-one subjects who participated in the pilot study according to stanine scores:[15]

Reading Level	Stanine Score	Subjects
High	9	2
High	8	2
High	7	3
Average	6	2
Average	5	2
Average	4	3
Low	3	3
Low	2	2
Low	1	2

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[12] Walter N. Durost (ed.) and others, Directions for Administering, Metropolitan Achievement Tests, Primary II Battery for Grade 2 (New York: Harcourt, Brace and World, Inc., 1959), pp. 16-19.

[13] Ibid., p. 3. [14] Ibid., p. 19. [15] Ibid., p. 18.

In addition to stanine scores cited immediately above, the following data were recorded to describe the subjects so that a comparison could be made with the subjects selected for the main study: (1) sex; (2) race; (3) median and range of the children's ages;[16] (4) mean, standard deviation, and standard error[17] for the standard scores in reading achievement[18] and for the deviation intelligence scores;[19] and (5) the percentage of the subjects' fathers within each of nine occupational levels identified in the *Dictionary of Occupational Titles*.[20]

Administration of the Preliminary Measuring Instrument and the Measure of Consonant Phoneme Knowledge

The measure of consonant phoneme knowledge and the preliminary measuring instrument of one-syllable simulated words were administered to each child individually in a room designated for that purpose at the University Laboratory

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[16] J. P. Guilford, *Fundamental Statistics in Psychology and Education* (fourth edition; New York: McGraw-Hill Book Company, 1965), pp. 53-55, 68-69.

[17] *Ibid.*, pp. 44-46, 82, 144-48. [18] Durost, *loc. cit.*

[19] Irving Lorge and Robert L. Thorndike, *The Lorge-Thorndike Intelligence Tests, Level 2, Grades 2 and 3,* (Boston: Houghton Mifflin Company, 1957).

[20] *Dictionary of Occupational Titles* (Vol. II of Occupational Classification and Industry Index. 2 vols.; third edition; Washington, D.C.: U.S. Government Printing Office, 1965), pp. 1-31.

School. The approximate time to complete the tests was one hour. The tests were usually completed in one session; however, if a child's attention waned, the tests were completed in two or three shorter sessions. The investigator administered all examinations from January 4, 1969, through January 17, 1969.

The measure of consonant phoneme knowledge. Each child in the pilot study was requested to select the letter representing the consonant phoneme beginning (or ending) the word designated by a picture. At no time were the consonant phonemes pronounced in isolation. The total percentage correct was calculated from the data recorded for each child on (1) initial consonant phoneme knowledge and (2) final consonant phoneme knowledge. The average percentage of the two measures cited above was calculated for all twenty-one subjects.

The preliminary measuring instrument. The list of eighty-four simulated words constituting the preliminary measuring instrument was inserted into a hand drum for presentation to the subjects.[21] Each child was allowed to turn the hand drum, the length of exposure of each simulated word not being controlled. The four simulated words were administered first in order to insure that the children understood the procedure. Each simulated word was presented in the following way:

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[21] Lafayette Hand Drum, Model No. 2303HO (Lafayette, Indiana: Lafayette Instrument Company).

nall	"Can you give me a real word you know that looks like this fake word (nall) except for the first letter?"
	"Pronounce this fake word (nall) for me."
baf	"Can you give me a real word you know that looks like this fake word (baf) except for the last letter?"
	"Pronounce this fake word (baf) for me."

The complete procedures for administering the measure of consonant phoneme knowledge and the preliminary measuring instrument are to be found in Appendix D, page 141.

Correct and incorrect responses were recorded for (1) each known word recalled which was visually similar to each simulated word; and (2) the pronunciation of each simulated word. The responses were recorded in phonic transcription for each simulated word.[22]

Construction of the Final Measure of Performance

The total number of correct responses made by the twenty-one children in the pilot study were tabulated for each simulated word on (1) the known word recalled (scored as pass or fail) and (2) the simulated word pronounced

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[22] E. L. Thorndike and Clarence L. Barnhart, Thorndike-Barnhart Advanced Junior Dictionary (Chicago: Scott, Foresman and Company, 1957), xxix.

(scored as pass or fail) for both initial and final consonant substitution. For example, if a child's responses to the simulated word (bain) were as follows, he received a score of pass-pass and thus a correct association:

Known Word Recalled	Simulated Word Pronounced	Tally
rain	bain	Pass-Pass

The percentage of children who obtained a correct association for each of the eighty words in the preliminary measuring instrument was calculated separately for the children within each group of high, average, and low readers for both initial and final consonant substitution. Tables VI and VII, pages 146 and 147, contain the percentages calculated for the consonant substitution techniques. These tables are located in Appendix E.

A decision was made by the investigator that the simulated words selected for the main study were to represent a range of difficulty and were to discriminate among three levels of general reading achievement (high, average, and low). To maximize the variance and to obtain a wide spread of scores, all simulated words which were identified incorrectly by every child within each reading level in the pilot study (P = 00.00) and all simulated words which were identified correctly by every child within each reading level in the pilot study (P = 100.00) were discarded. Lists of twenty words for initial consonant substitution and twenty words for final consonant substitution were derived by the above method. If there were more than twenty words left after employing the procedure cited above, the simulated words for each consonant substitution technique were placed in alphabetical order, numbered consecutively, and eliminated by referral to a table of random numbers until twenty words were reached.[23] The lists of words to be used in the final measuring instrument for initial and final consonant substitution are in Appendix F, page 149.

The items comprising the final measuring instrument employed in the main study were arranged in the same manner as the preliminary measuring instrument in the pilot study. All simulated words were placed in alphabetical order for each category representing initial and final consonant substitution and numbered consecutively from one to forty. Random numbers were used to place the simulated words in random order so that the children would not consistently use only one type of consonant substitution technique.[24] Two sample words were selected from the groups of simulated words discarded in which the largest percentage of subjects received a correct association. The final list of twenty-two words for each consonant substitution technique was printed in type size equivalent to that used in the basal readers (first half of level two).[25] The final measuring instrument, the data sheet, and the recording form may be found in Appendix G, page 151.

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[23] The RAND Corporation, loc. cit. [24] Ibid.

III. THE MAIN STUDY

The main study, in which the final measuring instrument was administered to a random sample of ninety second graders, was conducted to determine the ability of the children to employ initial and final consonant substitution.

Selection of Subjects

Appropriate school authorities in the Columbia Public Schools, Columbia, Missouri, were consulted to determine which schools possessed a cross-section of the population of school children in the geographic area. Five schools were recommended by authorities for participation in the investigation. Approval to conduct the study was granted by the Director of Elementary Education. The letter indicating his approval is found in Appendix H, page 158. This letter was photostatically reduced 8 per cent in order to place it on a single page.

A random sample of ninety second-grade children from a total population of 299 children, who were identified as being in their second year of instruction in the Columbia Public Schools, were selected for participation in the study. Twenty-five alternates were also selected randomly in case one of the original participants had to be eliminated. The selection procedure was as follows: (1) the 299 children were placed in alphabetical order and numbered consecutively; and (2) a table of random numbers was utilized to select 115 children (the ninety participants and twenty-five alternates).[26] A letter requesting permission for the children to participate in the study was mailed to each parent and approval secured. This letter of approval may also be found in Appendix H, page 159. In absence of a signed letter of approval by the parents, the child was not allowed to participate and the next alternate was chosen. Of the ninety children originally selected, all were used in the study with the exception of three.

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[25] Helen M. Robinson, Marion Monroe, and A. Sterl Artley, Friends Old and New (Chicago: Scott, Foresman and Company, 1963).

The same data were recorded for the subjects in the main study as those recorded in the pilot study so that comparisons could be made between samples.[27] The significance of difference between means was calculated for reading achievement[28] in the pilot study and the main study as well as for intelligence[29] in both studies.[30] The difference between means was calculated to determine if the sample in the pilot study (which was used to establish the final measuring instrument to be employed in the main study) was significantly different from the sample used in the main study on the two measures cited immediately above. In addition, skewness and kurtosis were calculated on the same two measures (for the main study only) to determine if the distributions in intelligence and reading achievement differed significantly from normal curve symmetry. These calculations were reported in order to select appropriate statistical procedures to analyze the data from the main investigation.[31]

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[26] The RAND Corporation, loc. cit.

[27] Cf., p. 65. [28] Durost, loc. cit.

Administration of the Final Measuring Instrument and the Measure of Consonant Phoneme Knowledge

The consonant phoneme test utilized in the pilot study and the final measuring instrument of simulated one-syllable words were administered to each child individually in a room designated for that purpose at each school from February 17, 1969, through March 17, 1969. The approximate time to complete the tests was forty minutes, completed in one session. The tests were administered by the investigator and one trained research assistant. The procedures used to administer the consonant phoneme test and the final measuring instrument as well as the method for recording the data were identical to those employed in the pilot study.[32]

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[29] Lorge and Thorndike, *loc. cit.*

[30] Ferguson, *op. cit.*, pp. 167-74.

[31] Merle W. Tate, *Statistics in Education and Psychology A First Course* (New York: The MacMillan Company, 1965), pp. 37-38, 82-87.

Agreement in scoring between the investigator and the research assistant was determined by rescoring the children's responses on twelve of the ninety tests administered. Each examiner exchanged six tests divided equally among three reading levels (high, average, and low). Errors between the scoring of examiners were noted and the percentage of agreement calculated.[33]

Reliability was calculated for the measures of initial consonant substitution and final consonant substitution separately as well as in combination. These reliabilities were recorded for both the preliminary measuring instrument used in the pilot study and for the final measuring instrument used in the main study.[34]

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[32] Cf., pp. 66-67.

[33] Fred N. Kerlinger, Foundations of Behavioral Research (New York: Holt, Rinehart and Winston, Inc., 1964), p. 507.

[34] Ferguson, op. cit., pp. 379-80.

IV. COMPARISON OF DATA FROM THE PILOT STUDY AND THE MAIN STUDY

Description of the Subjects

Table VIII reports the number and percentage of subjects within each sex and the median age and range of ages for the subjects in both the pilot study and the main study. Sex distribution was approximately equal (57 per cent boys and 43 per cent girls in the pilot study; and 49 per cent boys and 51 per cent girls in the main study).

TABLE VIII

COMPARISON OF SUBJECTS IN THE PILOT STUDY AND MAIN STUDY ON SEX AND AGE

Study	Subjects				TOTAL	Age	
	Boys	Per Cent	Girls	Per Cent		Median	Range
Pilot	12	57	9	43	21	7-10	7-4 to 8-9 (1-5)
Main	44	49	46	51	90	8-0	7-1 to 9-0 (1-9)

The median age of subjects in the main study was two months higher, and the range of ages four months greater than in the pilot study. The subjects in both studies were from a predominantly white population (90 per cent in the pilot study and 97 per cent in the main study).

The occupational level containing the highest percentage of fathers whose children participated in the studies was the professional, technical, and managerial level of the Dictionary of Occupational Titles.[35] This level is the highest on the scale. Table IX shows the

TABLE IX

COMPARISON OF PERCENTAGE OF FATHERS OF THE SUBJECTS IN THE PILOT STUDY AND THE MAIN STUDY IN EACH OF NINE OCCUPATIONAL LEVELS

Occupational Levels	Pilot Study		Main Study	
	Number	Per Cent	Number	Per Cent
1. Professional, Technical, and Managerial (Lawyer)	14	66.67	38	42.22
2. Clerical and Sales (Secretary)	2	9.52	17	18.89
3. Service (Waiter)	2	9.52	4	4.44
4. Farming, Fishing, Forestry, and Related Occupations (Farmer)	0	00.00	2	2.22
5. Processing (Butcher)	0	.00	1	1.11
6. Machine (Mechanic)	0	.00	5	5.57
7. Bench Work (Jeweler)	0	.00	2	2.22
8. Structural Work (Electrician)	2	9.52	18	20.00
9. Miscellaneous (Truck Driver)	1	4.77	3	3.33
Total	21	100.00	90	100.00

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[35] Dictionary of Occupational Titles, loc. cit.

percentage of fathers within each occupational level for both the pilot study and the main study. More occupational levels were represented in the main study.

Table X indicates the mean, standard deviation, and standard error of measurement for the intelligence test administered to subjects in the pilot study and the main study.[36] Skewness ($\underline{g}_1$) and kurtosis ($\underline{g}_2$) were reported only for intelligence scores of subjects in the main study because "measures of skewness and kurtosis tend to be unreliable in small samples. . . ."[37] There was no significant difference between means for intelligence in both studies ($t = -0.154$).[38] However, the means for the pilot and main study were significantly above the national norm mean of one hundred at the .01 level of confidence ($t = 3.008$ and $t = 6.812$, respectively).[39] Negative skewness was significant in the main study, indicating that more scores were grouped above the mean. No significant difference was found in kurtosis even though the distribution in the main study was somewhat platykurtic (less peaked). Because of the significance of skewness, the distribution of intelligence scores in the main study showed a systematic departure from normal curve symmetry.[40]

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[36] Lorge and Thorndike, loc. cit.

[37] Tate, op. cit., p. 85.

[38] Ferguson, op. cit., p. 167.

[39] Tate, op. cit., pp. 274-80.

TABLE X

COMPARISON OF SUBJECTS IN THE PILOT STUDY AND MAIN STUDY ON THE LORGE-THORNDIKE INTELLIGENCE TEST

Study	N	Mean	S.D.	SE_m	g_1	g_2
Pilot	21	108.00	12.193	±2.73		
Main	90	107.589	10.568	±1.12	-0.650†	2.758

†p < .02

Table XI shows the same data as reported in Table X for standard scores from the reading achievement subtest administered to subjects in the pilot study and main study.[41] The difference between means was significant at the .01 level of confidence (t = 3.053), indicating that subjects in the main study were significantly higher in general reading achievement than subjects in the pilot study.[42] The mean in the main study was also significantly above the national norm (mean = 44.5) at the .01 level of confidence (t = 8.682), while the mean for the pilot study was not (t = -0.014). The measure of kurtosis indicated that the distribution of scores in the main study was significantly platykurtic; no significant difference was found for skewness even though the distribution was somewhat negatively skewed.[43] Since the distributions of scores for the main study in intelligence and general reading achievement indicated a systematic departure from normal curve symmetry (as shown by measures of skewness for intelligence and kurtosis for reading achievement), nonparametric statistics were used.[44]

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[40] *Ibid.*, p. 324. [41] Durost, *loc. cit.*

[42] Ferguson, *op. cit.*, p. 171.

TABLE XI

COMPARISON OF SUBJECTS IN THE PILOT STUDY AND MAIN STUDY ON STANDARD SCORES FROM THE METROPOLITAN READING TEST

Study	N	Mean	S.D.	SE_m	g_1	g_2
Pilot	21	43.762	11.431	±2.556		
Main	90	52.000**	8.155	±0.864	-0.271	2.047†

$^{\dagger}p < .02$
$^{**}p < .01$

Since subjects in the main study were significantly higher in general reading achievement than subjects in the pilot study, Table XII was included to show the number and percentage of children in both studies who were within each of three reading levels (high, average, and low) identified from the stanine scores of the reading subtest of the Metropolitan Achievement Tests.[45] Whereas equal percentages of children were selected by the investigator for each of three levels of reading achievement in the pilot study, the following distribution of subjects was found by random sampling in the main study: 60 per cent classified as "high" readers; 34 per cent "average" readers; and only 6 per cent "low" readers. Ninety-four per cent of the subjects in the main study were in the categories of "average" and "high" readers as opposed to 66 2/3 per cent in the same categories in the pilot study. This distribution

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[43] Tate, op. cit., pp. 274-80, 324.

[44] Ferguson, op. cit., p. 174.

TABLE XII

NUMBER AND PERCENTAGE OF CHILDREN IN THE PILOT AND MAIN STUDY WHO WERE WITHIN HIGH, AVERAGE, AND LOW READING LEVELS OF THE METROPOLITAN READING SUBTEST

Reading Levels	Pilot Study		Main Study	
	Number	Per Cent	Number	Per Cent
High	7	33 1/3	54	60
Average	7	33 1/3	31	34
Low	7	33 1/3	5	6

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[45] Durost, *loc. cit.*

appears to account for subjects in the main study being (1) significantly higher in general reading achievement than subjects in the pilot study; and (2) significantly higher in reading achievement than the national norm.

Since the items on the final measuring instrument (which was used in the main study) were derived from the responses of subjects within the pilot study who were significantly lower in general reading achievement but comparable to the national norm, interpretation of findings should be made in the light of the fact that the main study represented predominantly average and high achieving readers. Because of the nature of the sample in the main study and the nature of the method used to derive the final measuring instrument, it is necessary to be cautious in generalizing the findings of the study beyond those in the immediate sample or a sample similar to the one described.

Consonant Phoneme Knowledge

The average percentages for knowledge of consonant phonemes in the initial and in the final position of simulated words were above ninety-five for subjects in both the pilot study and the main study. Table XIII indicates these average percentages. It appears that subjects in both studies were familiar with the consonant sounds employed in the initial and final positions of constructed simulated words.

TABLE XIII

AVERAGE PERCENTAGES FOR CONSONANT PHONEME KNOWLEDGE IN THE INITIAL AND FINAL POSITION OF SIMULATED WORDS FOR SUBJECTS IN THE PILOT STUDY AND THE MAIN STUDY

Study	Initial Consonant Phoneme Knowledge	Final Consonant Phoneme Knowledge
Pilot	96.20	95.78
Main	98.87	100.00

Reliability of Scoring Procedures and Reliability of the Initial and Final Consonant Substitution Tests

The investigator scored all tests given to the subjects in the pilot study. In the main study the percentage of agreement between the investigator and the research assistant on scoring accuracy was 99.58 per cent.

Table XIV reports the Kuder-Richardson, formula 20, reliability coefficients for test items used in initial consonant substitution and in final consonant substitution for both the pilot study and the main study.[46] The coefficients were reported for test items in each consonant substitution technique for both studies as well as for the total number of consonant substitution test items used. The reliability coefficients indicate that the test items seemed to have high intercorrelations with each other and that they appeared to be highly reliable.

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[46] Ferguson, *op. cit.*, pp. 379-80.

TABLE XIV

RELIABILITY OF INITIAL AND FINAL CONSONANT SUBSTITUTION TESTS

Study	Kuder-Richardson, formula 20 Initial Consonant Substitution	Final Consonant Substitution	Total
Pilot (40 items each)	0.953	0.937	0.971
Main (20 items each)	0.928	0.868	0.925

V. TREATMENT OF THE DATA

The main study was conducted to investigate the following question:

> Is the ability of second-grade children to recall a known word visually similar to a simulated word associated with their ability to identify correctly the same simulated word by means of initial and final consonant substitution?

In order to investigate the above question, the following null hypotheses were tested:

1. There is no association between the ability to recall a known word visually similar to a simulated word (except for the initial consonant) and the ability to identify correctly the simulated word by means of initial consonant substitution.

Chi Square for Independent Samples, explained by Siegel, was utilized to test the first hypothesis, using Yates' Correction for Continuity for cell entries of two through five and Fisher's exact probability test for cell entries of one or zero.[47] For each one of the twenty simulated words that was employed in initial consonant substitution, the responses of all ninety second-grade children were tabulated by means of a chi square two-by-two table formulated for each word as follows:

		Simulated Word Pronounced	
		Pass	Fail
Known Word Recalled	Pass		
	Fail		
			90 second graders

An example of the scoring procedure to illustrate frequencies to be entered into the four cells on one simulated word (*bain*) by only four of the ninety children was:

Child	Known Word Recalled	Simulated Word Pronounced	Tally
1.	rain	bain	Pass-Pass
2.	rain	ban	Pass-Fail
3.	ring	bing	Fail-Fail
4.	nan	bain	Fail-Pass

Each of the twenty chi squares calculated by the above procedure was tested for significance at the .05 level of confidence. In order to draw some type of overall conclusion, the twenty chi squares were combined under the assumption that each simulated word was independent of the other. The additive property of chi square, explained by Garrett, was utilized to test for significance over the entire list of twenty simulated words used in initial consonant substitution at the .05 level of confidence.[48]

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[47] Sidney Siegel, *Nonparametric Statistics for the Behavioral Sciences* (New York: McGraw-Hill Book Company, Inc., 1956), pp. 95-110.

> 2. There is no association between the ability to recall a known word visually similar to a simulated word (except for the final consonant) and the ability to identify correctly the simulated word by means of final consonant substitution.

Chi square was utilized to test the second hypothesis. The same procedure, as described in number one, was employed to test for significance of each of the twenty chi squares calculated at the .05 level of confidence. Also, Garrett's explanation of the additive property of chi square was utilized to test for significance over the entire list of twenty simulated words used in final consonant substitution at the .05 level of confidence.[49]

> 3. There is no relationship between the ability to employ initial and final consonant substitution in the identification of simulated words.

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[48] Henry E. Garrett, Statistics in Psychology and Education (New York: Longmans, Green and Company, 1959), p. 266.

[49] *Ibid.*

The Spearman rank correlation coefficient (corrected for tied observations) was utilized to test hypothesis three. Since the ninety second graders in the sample were selected randomly, the correlation between initial and final consonant substitution was tested for significance from zero at the .05 level of confidence.[50]

4. There is no difference among groups of children classified as high, average, and low in general reading achievement in their ability to identify simulated words correctly by means of initial consonant substitution.

The Kruskall-Wallis one-way analysis of variance by ranks (corrected for tied observations) was utilized to test hypothesis four.[51] The independent variable was the reading achievement subtest stanine score from the _Metropolitan Achievement Tests, Primary II Battery, 1959_, for second grade, administered to the children by the teachers in the Columbia Public Schools.[52] The children were divided into high, average, and low groups based on their general reading achievement scores. Differences were tested for significance at the .05 level of confidence.

5. There is no difference among groups of children classified as high, average, and low in general reading achievement in their ability to identify simulated words correctly by means of initial consonant substitution.

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[50] Siegel, _op_. _cit_., pp. 202-13.

[51] _Ibid_., pp. 184-93. [52] Durost, _loc_. _cit_.

The Kruskall-Wallis one-way analysis of variance by ranks, as described in number four, was utilized to test hypothesis five at the .05 level of confidence.[53]

VI. SUMMARY

The purpose of the chapter was to discuss procedures used in the present investigation. Topics considered were the construction of measuring instruments, the pilot study, the main study, comparison of data from the two studies, and treatment of the data.

Two measuring instruments were constructed by the investigator: (1) a preliminary list of one-syllable simulated words from which a final measuring instrument was derived to investigate the ability of second-grade children to employ initial and final consonant substitution; and (2) a measure of consonant phoneme knowledge to determine the ability of second graders to associate sound with the consonant letters utilized in the initial and final position of simulated words.

The pilot study was conducted with twenty-one second graders, divided equally among three reading levels (high, average, and low). From this study data were secured to construct the final measuring instrument. The main study, in which the final measuring instrument was administered to a random sample of ninety second graders, was conducted to determine the ability of the children to employ initial and final consonant substitution.

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[53] Siegel, loc. cit.

In comparing the data from the two studies, there were five common characteristics revealed among subjects in both the main study and the pilot study. The children were (1) above average in intelligence; (2) approximately equal in sex and age; and (3) predominantly of the white race. As a fourth characteristic, the majority of their fathers represented the highest occupational level in the *Dictionary of Occupational Titles*.[54] Finally, the children in both studies were knowledgeable of the consonant phonemes used to construct simulated words.

Subjects in the main study, however, were significantly higher in general reading achievement than subjects in the pilot study. Since the final measuring instrument (which was used in the main study) was derived from subjects in the pilot study who were significantly lower in general reading achievement, the findings of this study should be interpreted accordingly.

The distribution of scores in reading and in intelligence were found to differ significantly from normal curve symmetry for both studies; therefore, nonparametric statistics were selected and described for treatment of the data. The assumption of normality, which is a requirement for the use of parametric statistics, was not met. Reliability between scorers and reliability of the measuring instruments used in both studies were high.

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[54] *Dictionary of Occupational Titles*, *loc. cit.*

CHAPTER IV

ANALYSIS OF DATA

The purpose of this chapter is to discuss the analysis of data pertaining to investigation of the following question:

> Is the ability of second-grade children to recall a known word visually similar to a simulated word associated with their ability to identify correctly the same simulated word by means of initial and final consonant substitution?

In order to investigate the above question, five null hypotheses were tested for significance at the .05 level of confidence. Each hypothesis is recorded and the results reported in one of the five separate sections (one for each hypothesis) included in this chapter.

I. ABILITY TO EMPLOY INITIAL CONSONANT SUBSTITUTION

Hypothesis One

> There is no association between the ability to recall a known word visually similar to a simulated word (except for the initial consonant) and the ability to identify correctly the simulated word by means of initial consonant substitution.

Table XV contains the data in regard to hypothesis one. A chi square was calculated by the procedures stated in Chapter III for each one of the twenty simulated words used to investigate the process of initial consonant

TABLE XV

CHI SQUARES CALCULATED FROM THE RESPONSES OF NINETY SECOND-GRADE PUPILS FOR TWENTY SIMULATED WORDS USED IN INITIAL CONSONANT SUBSTITUTION

Simulated Word		Frequencies††				x^2	Correction	Sig.
		1-Pass-2-Pass	Pass-Fail	Fail-Pass	Fail-Fail			
1.	bain	48	5	9	28	38.368	Yates'	.001
2.	dall	47	22	1	20	23.481	Yates'†	.001
3.	dat	72	8	2	8	25.201	Yates'	.001
4.	fot	55	3	5	27	54.704	Yates'	.001
5.	gake	71	6	5	8	20.538	Yates'	.001
6.	gop	60	7	3	20	44.153	Yates'	.001
7.	hed	54	5	9	22	34.876	Yates'	.001
8.	mear	61	0	9	20	50.172	Yates'†	.001
9.	mick	60	0	9	21	50.939	Yates'†	.001
10.	nalk	37	10	2	41	47.204	Yates'	.001
11.	nide	53	4	10	23	36.172	Yates'	.001
12.	rast	43	0	9	38	56.903	Yates'†	.001
13.	reat	69	3	9	9	22.362	Yates'	.001
14.	rell	60	5	4	21	47.530	Yates'	.001
15.	ren	56	2	15	17	27.647	Yates'	.001
16.	sig	64	7	3	16	39.734	Yates'	.001
17.	sout	48	5	14	23	25.859	Yates'	.001
18.	tay	59	8	8	15	25.546		.001
19.	wid	47	0	12	31	48.544	Yates'†	.001
20.	yill	62	10	3	15	31.240	Yates'	.001
					$\Sigma x^2 =$	751.173		.001

†Checked with Fisher's exact probability test

††First line of frequencies 1-(known word recalled)
Second line of frequencies 2-(simulated word pronunciation)

substitution.[1] Each chi square represents the responses of ninety second-grade children to one simulated word. The ninety simulated words are listed in alphabetical order in Table XV with the frequencies for each cell entry of the chi square two-by-two table reported for each simulated word. The type of correction used for each chi square calculated is indicated. For cell entries of two through five, Yates' Correction for Continuity was employed; for cell entries of one or zero, Fisher's exact probability test was used.[2] Each chi square, with one degree of freedom, was tested for significance at the .05 level of confidence. All twenty chi squares were then summed and the resulting number tested for significance at the .05 level of confidence, with twenty degrees of freedom, so that an overall conclusion could be drawn regarding the ability of the entire sample to use initial consonant substitution.[3]

Using the frequencies for each simulated word presented in Table XV, each one of the twenty chi squares was found to be significant. The summation of all twenty chi squares ($\Sigma x^2 = 751.173$), with twenty degrees of freedom, was also found to be significant. All differences in analysis of the data pertaining to this hypothesis were well within the established limits of five per cent. A table of critical values for the chi square test was used to accept or reject the null hypothesis.[4] Hypothesis one was rejected. That is to say, there is an association between the ability to recall a known word visually similar to a simulated word (except for the initial consonant) and the ability to identify correctly the simulated word by means of initial consonant substitution.

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[1] Cf., pp. 83-84.

[2] Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill Book Company, Inc., 1956), pp. 95-110.

[3] Henry E. Garrett, Statistics in Psychology and Education (New York: Longmans, Green and Company, 1959), p. 266.

II. ABILITY TO EMPLOY FINAL CONSONANT SUBSTITUTION

Hypothesis Two

> There is no association between the ability to recall a known word visually similar to a simulated word (except for the final consonant) and the ability to identify correctly the simulated word by means of final consonant substitution.

The data for hypothesis two are presented in Table XVI. The same procedures and calculations used in hypothesis one, cited above, were completed for the final consonant substitution process. Each chi square represents the responses of ninety second-grade children to one simulated word. The twenty simulated words are listed in

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[4] Siegel, op. cit., p. 249.

TABLE XVI

CHI SQUARES CALCULATED FROM THE RESPONSES OF NINETY SECOND-GRADE PUPILS FOR TWENTY SIMULATED WORDS USED IN FINAL CONSONANT SUBSTITUTION

Simulated Word		Frequencies††				x^2	Correction	Sig.
		1-Pass-2-Pass	Pass-Fail	Fail-Pass	Fail-Fail			
1.	bas	38	4	23	25	16.680	Yates'	.001
2.	beag	27	12	12	39	18.789		.001
3.	bup	57	22	1	10	14.118	Yates'†	.001
4.	cag	28	26	5	31	11.820	Yates'	.001
5.	carm	52	5	13	20	25.466	Yates'	.001
6.	dil	43	11	16	20	11.843		.001
7.	fal	28	20	6	36	18.489		.001
8.	feem	59	9	9	13	18.925		.001
9.	goap	60	6	6	18	39.096		.001
10.	hak	42	14	6	28	27.960		.001
11.	hon	37	11	17	25	12.507		.001
12.	leat	41	5	21	23	16.108	Yates'	.001
13.	mep	34	5	9	42	40.082	Yates'	.001
14.	pag	23	9	16	42	16.473		.001
15.	parl	25	3	10	52	40.414	Yates'	.001
16.	pok	28	9	7	46	35.777		.001
17.	san	49	2	18	21	26.389	Yates'	.001
18.	seeg	62	24	1	3	2.105	Yates'†	
19.	tos	11	8	16	55	8.924		.01
20.	wik	37	15	14	24	10.526		.01
					$\Sigma x^2 =$	412.500		.001

†Checked with Fisher's exact probability test

††First line of frequencies 1-(known word recalled)
Second line of frequencies 2-(simulated word pronunciation)

alphabetical order in Table XVI with the frequencies for each cell entry of the chi square two-by-two table reported for each simulated word as in Table XV, page 90. The type of correction used for each chi square calculated is indicated. The twenty chi squares, with one degree of freedom, were tested separately for significance at the .05 level of confidence. All twenty chi squares were summed and the resulting number also tested for significance at the .05 level of confidence with twenty degrees of freedom so that an overall conclusion could be drawn regarding the ability of the entire sample to use final consonant substitution.

Using the frequencies for each simulated word presented in Table XVI, each one of the chi squares was significant, except for (seeg), number 18. However, the summation of all twenty chi squares ($\Sigma x^2 = 412.500$), with twenty degrees of freedom, was significant. As can be observed in Table XVI, all chi squares, with the exception of (seeg), were well within the established five per cent level of confidence. The same table of critical values for the chi square test, as employed in hypothesis one, was used to accept or reject the null hypothesis.[5] Hypothesis two was rejected. There is an association between the ability to recall a known word visually similar to a simulated word

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[5] Siegel, loc. cit.

(except for the final consonant) and the ability to identify correctly the simulated word by means of final consonant substitution.

III. RELATIONSHIP BETWEEN THE ABILITY TO EMPLOY INITIAL AND FINAL CONSONANT SUBSTITUTION

Hypothesis Three

> There is no relationship between the ability to employ initial and final consonant substitution in the identification of simulated words.

The Spearman rank correlation coefficient (corrected for tied observations) was utilized to test hypothesis three.[6] The number of correct associations for the twenty simulated words within each consonant substitution technique was totaled for each of ninety children in the sample. The scores were then ranked from lowest to highest for each subject on (1) initial consonant substitution and (2) final consonant substitution. The scores for the ninety children on number of correct associations for each consonant substitution technique are located in Table XVII, Appendix I, page 161. The Spearman rank correlation coefficient was computed. Table XVIII shows the summation scores from the raw data which were used to compute the coefficient. The correlation between the ability of ninety second-grade children to employ initial and final consonant substitution in the identification of simulated words was $r_s = .837$.

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[6] *Ibid.*, pp. 202-13.

TABLE XVIII

SUMMATION OF SCORES USED TO COMPUTE THE SPEARMAN RANK CORRELATION COEFFICIENT CORRECTED FOR TIED OBSERVATIONS

N	Σx^2†	Σy^2††	Σd^2	df (N-2)	r_s
90	60,451.50	60,460.00	19,762.00	88	.837

†Initial Consonant Substitution
††Final Consonant Substitution

Since the ninety second-grade pupils in the sample were selected randomly, the correlation between initial and final consonant substitution was tested for significance from zero at the .05 level of confidence.[7] In the population of subjects from which the sample of ninety children was drawn, the ability to employ initial and final consonant substitution was significantly related (t = 14.324, with eighty-eight degrees of freedom). This significance was true at the .001 level of confidence. A table of critical values was used to accept or reject the null hypothesis.[8] Hypothesis three was rejected. There is a relationship between the ability to employ initial and final consonant substitution in the identification of simulated words.

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[7] *Ibid.*, pp. 210-14. [8] *Ibid.*, p. 248.

IV. GENERAL READING ACHIEVEMENT AND THE ABILITY TO EMPLOY INITIAL CONSONANT SUBSTITUTION

Hypothesis Four

> There is no difference among groups of children classified as high, average, and low in general reading achievement in their ability to identify simulated words correctly by means of initial consonant substitution.

The Kruskall-Wallis one-way analysis of variance by ranks (corrected for tied observations) was utilized to test hypothesis four.[9] The independent variable was the reading achievement subtest stanine score from the *Metropolitan Achievement Tests, Primary II Battery, 1959*, for second grade, administered to the children by the teachers in the Columbia Public Schools.[10] The ninety children were divided into "high", "average", and "low" groups based on stanine scores seven through nine, four through six, and one through three, respectively, from the reading achievement test cited above. The number of correct associations for initial consonant substitution was summed for each child and the scores ranked from lowest to highest. Table XVII, Appendix I, page 161, contains the raw scores for the children within each reading level on the number of correct associations for initial consonant substitution. An H for the Kruskall-Wallis one-way analysis of variance was computed, the result being 50.55. The summation scores used to compute the H value are located in Table XIX. The H value was tested for significance at the .05 level of confidence. On reference to a table of chi square with two degrees of freedom, an H of 50.55 was significant at the .001 level of confidence.[11]

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[9] Siegel, *op. cit.*, pp. 184-93.

[10] Walter N. Durost (ed.) and others, *Directions for Administering, Metropolitan Achievement Tests, Primary II Battery for Grade 2* (New York: Harcourt, Brace, and World, Inc., 1959), pp. 16-19.

TABLE XIX

SUMMATION OF SCORES USED TO COMPUTE THE KRUSKALL-WALLIS ONE-WAY ANALYSIS OF VARIANCE CORRECTED FOR TIED OBSERVATIONS FOR INITIAL CONSONANT SUBSTITUTION

N	$\Sigma\frac{R^2}{n}$	ΣT	df (k-1)	H
90	220,657.68	3,492	2	50.55***

***$p < .001$

Hence, hypothesis four was rejected. There is a difference among groups of children classified as "high", "average", and "low" in general reading achievement in their ability to identify simulated words correctly by means of initial consonant substitution.

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[11] Siegel, *op. cit.*, p. 249.

The median ranks were located for each of three reading levels from the ranked data of correct associations for initial consonant substitution. Table XX indicates that second-grade pupils, who were classified as "high" readers, used initial consonant substitution more efficiently than either "average" or "low" readers. Children classified as "average" readers were more efficient in the process than "low" readers.

TABLE XX

MEDIAN RANKS FOR NINETY HIGH, AVERAGE, AND LOW READERS ON CORRECT ASSOCIATIONS FOR INITIAL CONSONANT SUBSTITUTION

	High	Average	Low
Median Rank from Lowest to Highest	64	22	4

V. GENERAL READING ACHIEVEMENT AND THE ABILITY TO EMPLOY FINAL CONSONANT SUBSTITUTION

Hypothesis Five

> There is no difference among groups of children classified as high, average, and low in general reading achievement in their ability to identify simulated words correctly by means of final consonant substitution.

The same procedures and calculations used in hypothesis four, cited above, were completed for final consonant substitution. The number of correct associations for each of the twenty simulated words in final consonant substitution was summed for ninety second-grade children who were previously classified within one of three levels of general reading achievement (high, average, or low). Table XVII, Appendix I, page 161, contains the raw scores for the number of correct associations in final consonant substitution made by each child. The scores for correct associations were ranked from lowest to highest, and an H for the Kruskall-Wallis one-way analysis of variance was computed. Table XXI shows the summed scores used to compute the statistic. These were calculated from the raw scores cited above. The value of H (38.85) was tested for significance at the .05

TABLE XXI

SUMMATION OF SCORES USED TO COMPUTE THE KRUSKALL-WALLIS ONE-WAY ANALYSIS OF VARIANCE CORRECTED FOR TIED OBSERVATIONS FOR FINAL CONSONANT SUBSTITUTION

N	$\Sigma \frac{R^2}{n}$	ΣT	df (k-1)	H
90	212,714.65	3,390	2	38.85***

$^{***}p < .001$

level of confidence. Referring again to a table of chi square with two degrees of freedom, an H of 38.85 was significant at the .001 level of confidence.[12] Hypothesis five is rejected. There is a difference among groups of children classified as "high", "average", and "low" in general reading achievement in their ability to identify simulated words correctly by means of final consonant substitution.

The median ranks within each reading level were also located from the ranked data of correct associations for final consonant substitution. Table XXII reveals approximately the same median rank for each reading level in the ability to use final consonant substitution that was recorded for the ability to use initial consonant substitution in Table XIX, page 98. Children within the "high"

TABLE XXII

MEDIAN RANKS FOR NINETY HIGH, AVERAGE, AND LOW READERS ON CORRECT ASSOCIATIONS FOR FINAL CONSONANT SUBSTITUTION

	High	Average	Low
Median Rank from Lowest to Highest	63	24.5	7

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[12] Ibid.

reading category were more efficient in their ability to employ final consonant substitution than were children in either "average" or "low" reading categories. Also, children within the "average" category appeared to be more efficient than "low" readers.

V. SUMMARY

Five null hypotheses were used to investigate the following question:

> Is the ability of second-grade children to recall a known word visually similar to a simulated word associated with their ability to identify correctly the same simulated word by means of initial and final consonant substitution?

Each null hypothesis was rejected at the .001 level of confidence. The following findings are reported by the investigator:

1. There is a highly significant association between the ability to recall a known word visually similar to a simulated word (except for the initial consonant) and the ability to identify correctly the simulated word by means of initial consonant substitution.

2. There is a highly significant association between the ability to recall a known word visually similar to a simulated word (except for the final consonant) and the ability to identify correctly the simulated word by means of final consonant substitution.

3. There is a highly significant relationship between the ability to employ initial and final consonant substitution in the identification of simulated words.

4. There is a highly significant difference among groups of children classified as high, average, and low in general reading achievement in their ability to identify simulated words correctly by means of initial consonant substitution.

5. There is a highly significant difference among groups of children classified as high, average, and low in general reading achievement in their ability to identify simulated words correctly by means of final consonant substitution.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

I. THE PROBLEM

The purpose of this study was to investigate the ability of second-grade children to employ initial and final consonant substitution as a technique in word identification. The technique of initial and final consonant substitution demands the ability to recall a known word that is visually similar to an unknown word (except for the initial or final consonant) and to pronounce correctly the unknown word by the substitution process. It was the child's ability to engage in these acts that this study attempted to investigate.

More specifically, the following question was investigated:

> Is the ability of second-grade children to recall a known word visually similar to a simulated word associated with their ability to identify correctly the same simulated word by means of initial and final consonant substitution?

In order to investigate the above question, the following five null hypotheses were tested for significance at the .05 level of confidence.

1. There is no association between the ability to recall a known word visually similar to a simulated word (except for the initial consonant) and the ability to identify correctly the

simulated word by means of initial consonant substitution.

2. There is no association between the ability to recall a known word visually similar to a simulated word (except for the final consonant) and the ability to identify correctly the simulated word by means of final consonant substitution.

3. There is no relationship between the ability to employ initial and final consonant substitution in the identification of simulated words.

4. There is no difference among groups of children classified as high, average, and low in general reading achievement in their ability to identify simulated words correctly by means of initial consonant substitution.

5. There is no difference among groups of children classified as high, average, and low in general reading achievement in their ability to identify simulated words correctly by means of final consonant substitution.

Consonant substitution is one of the first word attack skills taught to children during the beginning stages of word identification. Though the actual use of consonant substitution has not been studied, reading authorities and certain linguists have advocated this technique of word identification and incorporated the method into a number of reading programs. On the other hand, certain reading authorities have expressed doubts regarding its value for disabled readers without justification based on research evidence. Because of need to determine the valuable elements within a program rather than comparing approach with approach in reading instruction, this study was conducted to glean some insight into the use of consonant substitution as one skill to employ in the identification of unknown words.

II. DESIGN OF THE STUDY

Two measuring instruments were constructed by the investigator: (1) a preliminary measuring instrument of one-syllable simulated words from which a final measuring instrument was derived to investigate the ability of second-grade pupils to employ initial and final consonant substitution; and (2) a measure of consonant phoneme knowledge to determine the ability of second-grade pupils to associate sound with the consonant letters utilized in the initial and final position of the constructed simulated words.

A pilot study was conducted with twenty-one second-grade pupils, who were selected by the investigator so that they were divided equally among three levels of general reading achievement (high, average, and low). This pilot study was conducted to derive the final measuring instrument of forty-four simulated words (which was used in the main study) from the preliminary measuring instrument of eighty-four simulated words. The main study was conducted with ninety second-grade pupils, who were selected by random procedure, to determine the ability of the children to employ initial and final consonant substitution in the identification of unknown words. In each case the child was asked to recall a known word that was visually similar to an unknown word (except for the initial or final consonant) and to pronounce the unknown word by the substitution process.

In comparing the data from the two studies, five common characteristics were revealed among subjects in both the main study and the pilot study. The children were (1) approximately equal in sex and age; (2) predominantly of the white race; (3) above average in intelligence; (4) from families whose fathers represented the highest occupational level; and (5) knowledgeable of the consonant phonemes used in the construction of the simulated words.

Subjects in the main study, however, were significantly higher in general reading achievement than subjects in the pilot study. Since the items on the final measuring instrument (which was used in the main study) were derived from subjects in the pilot study who were significantly lower in general reading achievement, the findings of this study need to be interpreted accordingly.

The distribution of scores in both reading and intelligence was found to differ significantly from normal curve symmetry for both studies; therefore, the nonparametric statistical procedure was selected and described for treatment of the data.

III. SUMMARY OF SIGNIFICANT FINDINGS

Five null hypotheses were used to investigate the following question:

> Is the ability of second-grade children to recall a known word visually similar to a simulated word associated with their ability to identify correctly the same simulated word by means of initial and final consonant substitution?

The analysis of the data indicated that each null hypothesis was rejected at the .001 level of confidence. The following findings are reported by the investigator:

1. There is a highly significant association between the ability to recall a known word visually similar to a simulated word (except for the initial consonant) and the ability to identify correctly the simulated word by means of initial consonant substitution. ($\Sigma x^2 = 751.173$)
2. There is a highly significant association between the ability to recall a known word visually similar to a simulated word (except for the final consonant) and the ability to identify correctly the simulated word by means of final consonant substitution. ($\Sigma x^2 = 412.500$)
3. There is a highly significant relationship between the ability to employ initial and final consonant substitution. ($r_s = .837$)
4. There is a highly significant difference among groups of children classified as high, average, and low in general reading achievement in their ability to identify simulated words correctly by means of initial consonant substitution. ($H = 50.55$)
5. There is a highly significant difference among groups of children classified as high, average, and low in general reading achievement in their ability to identify simulated

words correctly by means of final consonant substitution. (H = 38.85)

IV. CONCLUSIONS

The following conclusions are drawn on the basis of evidence presented and are to be interpreted in the light of the conditions and limitations set forth in this study:

1. Second-grade children are able to employ effectively the process of single consonant substitution in the identification of unknown one-syllable words.

2. Second-grade children, who are differentiated among high, average, and low levels of general reading ability, are also differentiated in the same way in their ability to employ effectively the process of single consonant substitution in the identification of unknown one-syllable words.

V. IMPLICATIONS

1. The results of this study have indicated the effectiveness of second graders to use the substitution process in the identification of unknown one-syllable words. Authors of instructional reading materials should continue employing the use of the consonant substitution process in their reading materials in first and second grades.

2. The final measuring instrument constructed by the investigator seems to be a reliable measure for both

initial and final consonant substitution. The measure also tends to discriminate among high, average, and low levels of general reading achievement. Therefore, the testing procedure may be one to employ as a diagnostic tool for determining the ability to employ initial and final consonant substitution in the identification of unknown one-syllable words.

3. Because children vary in their ability to employ the substitution process in word identification, instruction and practice should be differentiated according to individual needs so that each child eventually becomes proficient in the use of this technique. Though the small number of subjects at the lower end of the distribution of general reading achievement limits the generalization that one may make, there seems to be an indication that low reading achievers have difficulty using the substitution process in word perception. Hence, special instructional attention should be given to this segment of the reading distribution.

VI. QUESTIONS FOR FURTHER RESEARCH

1. To what extent would second-grade pupils employ the process of initial and final consonant substitution in the identification of unknown words consisting of more than one syllable and constructed with the use of consonant

blends and digraphs as well as single consonants in the initial and final positions?

2. What factors contribute to the ability to use the consonant substitution process among children differentiated by varying degrees of general reading ability?

3. What is the relative effectiveness of the substitution process and the letter-by-letter sounding process in identifying unfamiliar words?

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APPENDIX A

TABLE I

FREQUENCY TABULATION FOR INITIAL CONSONANT SUBSTITUTION PHONOGRAMS

Phonogram		Scott, Foresman	Bartschi and Stone	TOTAL	Phonogram		Scott, Foresman	Bartschi and Stone	TOTAL
1.	ay	65	7	72	22.	and	20	3	23
2.	at	58	5	63	23.	oat	19	2	21
3.	et	54	4	58	24.	ed	18	2	20
4.	ick	51	2	53	25.	ain	17	1	18
5.	ill	47	3	50	26.	eep	15	3	18
6.	an	39	5	44	27.	ump	15	2	17
7.	ook	38	3	41	28.	eat	15	1	16
8.	en	35	5	40	29.	own	13	3	16
9.	ell	33	6	39	30.	out	14	1	15
10.	ear	32	4	36	31.	ast	13	2	15
11.	ack	33	2	35	32.	ing	12	3	15
12.	ake	30	4	34	33.	ut	12	3	15
13.	in	32	1	33	34.	ad	12	3	15
14.	ot	30	3	33	35.	oom	13	1	14
15.	ight	29	3	32	36.	up	13	1	14
16.	all	27	4	31	37.	ig	11	2	13
17.	ame	26	4	30	38.	un	9	3	12
18.	ide	24	3	27	39.	ar	9	2	11
19.	im	24	2	26	40.	it	9	2	11
20.	old	22	4	26	41.	alk	9	2	11
21.	op	21	2	23	42.	id	9	1	10

TABLE II

FREQUENCY TABULATION FOR FINAL CONSONANT SUBSTITUTION PHONOGRAMS

Phonogram	Scott, Foresman	Bartschi and Stone	TOTAL
1. be	16	3	19
2. pa	15	0	15
3. wi	10	4	14
4. fee	11	2	13
5. hi	10	3	13
6. ru	10	1	11
7. ea	9	2	11
8. i	7	4	11
9. ca	6	4	10
10. hu	9	0	9
11. bu	8	1	9
12. pu	7	2	9
13. ra	7	1	8
14. di	5	3	8
15. ma	7	0	7
16. pe	6	1	7
17. ha	4	3	7
18. wor	5	1	6
19. pi	5	0	5
20. cu	4	1	5
21. har	4	1	5
22. me	4	1	5
23. ne	4	1	5
24. ba	3	2	5
25. lea	3	2	5
26. ho	2	3	5
27. sa	2	3	5
28. lis	4	0	4
29. roa	4	0	4
30. ta	4	0	4
31. fa	2	2	4
32. mai	3	0	3
33. goa	2	1	3
34. hel	2	1	3
35. see	2	1	3
36. re	2	1	3
37. bea	2	0	2
38. car	2	0	2
39. par	2	0	2
40. po	2	0	2
41. ti	2	0	2
42. to	2	0	2

TABLE III

FREQUENCY TABULATION FOR INITIAL CONSONANTS USED IN FORMULATING SIMULATED WORDS

Initial Consonant		Scott, Foresman	Bartschi and Stone	Total
1.	s	171	37	208
2.	h	126	34	160
3.	b	120	38	158
4.	t	113	21	134
5.	c	88	25	113
6.	f	82	30	112
7.	p	96	15	111
8.	m	70	21	91
9.	d	71	12	83
10.	r	61	16	77
11.	w	54	23	77
12.	l	58	15	73
13.	g	50	19	69
14.	n	45	13	58
15.	y	14	6	20

TABLE IV

FREQUENCY TABULATION FOR FINAL CONSONANTS USED IN FORMULATING SIMULATED WORDS

Final Consonant	Scott, Foresman	Bartschi and Stone	Total
1. t	62	55	117
2. n	30	41	71
3. d	19	43	63
4. l	18	22	40
5. k	20	16	36
6. p	21	11	32
7. g	12	14	26
8. s	8	17	25
9. m	14	7	21

TABLE V

CONSONANT USAGE IN FORMULATING SIMULATED WORDS

Initial Consonant Substitution		Final Consonant Substitution	
Consonant	Number of Times Used	Consonant	Number of Times Used
1. b	3	1. d	2
2. c	2	2. g	7
3. d	3	3. k	7
4. f	2	4. l	6
5. g	4	5. m	4
6. h	3	6. n	3
7. l	2	7. p	5
8. m	3	8. s	5
9. n	3	9. t	3
10. p	2		
11. r	4		
12. s	3		
13. t	3		
14. w	2		
15. y	3		

SIMULATED WORDS FOR INITIAL CONSONANT SUBSTITUTION

Simulated Word	Pronunciation	Simulated Word	Pronunciation
1. bain	bān	22. mun	mŭn
2. bim	bĭm	23. nad	năd
3. bown	boun	24. nalk	nôk
4. cack	kăk	25. nide	nīd
5. cump	kŭmp	26. pame	pām
6. dall	dôl	27. pold	pōld
7. dar	där	28. rast	răst
8. dat	dăt	29. reat	rēt
9. fand	fănd	30. rell	rĕl
10. fot	fŏt	31. ren	rĕn
11. gake	gāk	32. sig	sĭg
12. goom	güm	33. soat	sōt
13. gop	gŏp	34. sout	sout
14. gup	gŭp	35. tay	tā
15. han	hăn	36. teep	tēp
16. hed	hĕd	37. tet	tĕt
17. hing	hĭng	38. wid	wĭd
18. lin	lĭn	39. wook	wu̇k
19. lut	lŭt	40. yight	yīt
20. mear	mîr	41. yill	yĭl
21. mick	mĭk	42. yit	yĭt

SIMULATED WORDS FOR FINAL CONSONANT SUBSTITUTION

Simulated Word	Pronunciation	Simulated Word	Pronunciation
1. bas	băs	22. mais	mās
2. beag	bēg	23. mak	măk
3. bep	bĕp	24. mep	mĕp
4. bup	bŭp	25. nem	nĕm
5. cag	kăg	26. pag	păg
6. carm	kärm	27. parl	pärl
7. cul	kŭl	28. pel	pĕl
8. dil	dĭl	29. pim	pĭm
9. ean	ēn	30. pok	pŏk
10. fal	făl	31. puk	pŭk
11. feem	fēm	32. rad	răd
12. goap	gōp	33. reg	rĕg
13. hak	hăk	34. roat	rōt
14. helt	hĕlt	35. rus	rŭs
15. harl	härl	36. san	săn
16. hig	hĭg	37. seeg	sēg
17. hon	hŏn	38. tas	tăs
18. huk	hŭk	39. tid	tĭd
19. ip	ĭp	40. tos	tŏs
20. leat	lēt	41. wik	wĭk
21. lisk	lĭsk	42. worg	wûrg

APPENDIX B

PRELIMINARY MEASURING INSTRUMENT

han
lin
tas
reg
hing
rast
leat
mear
tay
lut
worg
goom
nide
puk
wik
goap
reat
ean
nad
rad
seeg
cag
bown
tet
cack
mak
fot
mep
feem
pold
cul
hig
rus
soat
bep
tos
dar
ip
tid
wid
hed
gup
bain
nalk
carm
helt
san
hak
fal
roat
yit
mun
pag
gop
sout
yill
bim
huk
pim
ren
cump
dall
gake
lisk
teep
sig
fand
dil
nem
pok
pel
pame
mick
mais
parl
dat
harl
beag
wook
hon
bas
rell
bup
yight

RECORDING FORM

SIMULATED WORD LIST

Use Initial or Final Consonant Substitution Question	Simulated Word	Known Word Recalled	Simulated Word Pronunciation
Sample Words			
1. Initial	han	________	________
2. Initial	lin	________	________
3. Final	tas	________	________
4. Final	reg	________	________
Test			
1. Initial	hing	________	________
2. Initial	rast	________	________
3. Final	leat	________	________
4. Initial	mear	________	________
5. Initial	tay	________	________
6. Initial	lut	________	________
7. Final	worg	________	________
8. Initial	goom	________	________
9. Initial	nide	________	________
10. Final	puk	________	________
11. Final	wik	________	________
12. Final	goap	________	________
13. Initial	reat	________	________
14. Final	ean	________	________

Use Initial or Final Consonant Substitution Question		Simulated Word	Known Word Recalled	Simulated Word Pronunciation
15.	Initial	nad	________	________
16.	Final	rad	________	________
17.	Final	seeg	________	________
18.	Final	cag	________	________
19.	Initial	bown	________	________
20.	Initial	tet	________	________
21.	Initial	cack	________	________
22.	Final	mak	________	________
23.	Initial	fot	________	________
24.	Final	mep	________	________
25.	Final	feem	________	________
26.	Initial	pold	________	________
27.	Final	cul	________	________
28.	Final	hig	________	________
29.	Final	rus	________	________
30.	Initial	soat	________	________
31.	Final	bep	________	________
32.	Final	tos	________	________
33.	Initial	dar	________	________
34.	Final	ip	________	________
35.	Final	tid	________	________
36.	Initial	wid	________	________
37.	Initial	hed	________	________

Use Initial or Final Consonant Substitution Question	Simulated Word	Known Word Recalled	Simulated Word Pronunciation
38. Initial	gup	________	________
39. Initial	bain	________	________
40. Initial	nalk	________	________
41. Final	carm	________	________
42. Final	helt	________	________
43. Final	san	________	________
44. Final	hak	________	________
45. Final	fal	________	________
46. Final	roat	________	________
47. Initial	yit	________	________
48. Initial	mun	________	________
49. Final	pag	________	________
50. Initial	gop	________	________
51. Initial	sout	________	________
52. Initial	yill	________	________
53. Initial	bim	________	________
54. Final	huk	________	________
55. Final	pim	________	________
56. Initial	ren	________	________
57. Initial	cump	________	________
58. Initial	dall	________	________
59. Initial	gake	________	________
60. Final	lisk	________	________

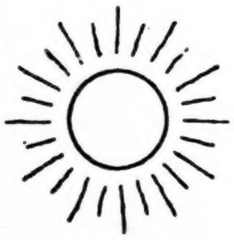
Use Initial or Final Consonant Substitution Question		Simulated Word	Known Word Recalled	Simulated Word Pronunciation
61.	Initial	teep	________	________
62.	Initial	sig	________	________
63.	Initial	fand	________	________
64.	Final	dil	________	________
65.	Final	nem	________	________
66.	Final	pok	________	________
67.	Final	pel	________	________
68.	Initial	pame	________	________
69.	Initial	mick	________	________
70.	Final	mais	________	________
71.	Final	parl	________	________
72.	Initial	dat	________	________
73.	Final	harl	________	________
74.	Final	beag	________	________
75.	Initial	wook	________	________
76.	Final	hon	________	________
77.	Final	bas	________	________
78.	Initial	rell	________	________
79.	Final	bup	________	________
80.	Initial	yight	________	________

APPENDIX C

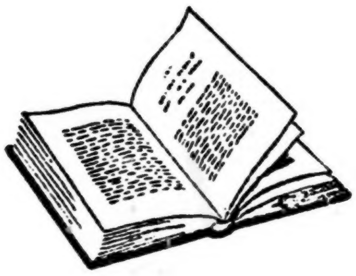
MEASURE FOR CONSONANT PHONEME KNOWLEDGE

SAMPLE PICTURES

Initial Consonant Substitution

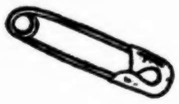


s b t

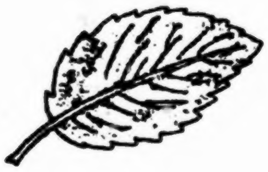


m b g

Final Consonant Substitution



k s n



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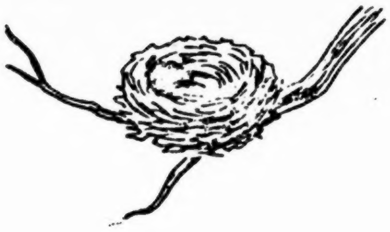
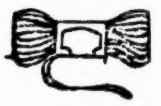
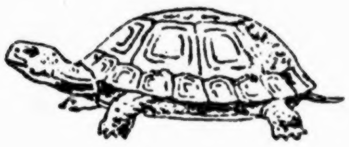


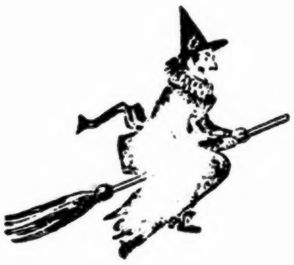
n f p



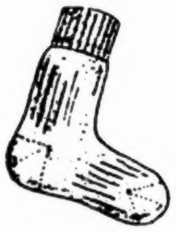
y l p



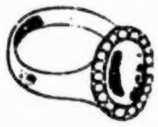
b t m



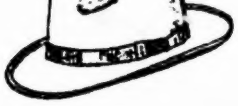
l w d



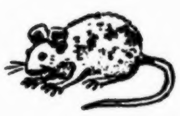
s g n



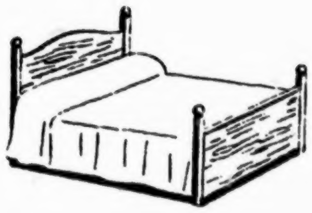
r t w



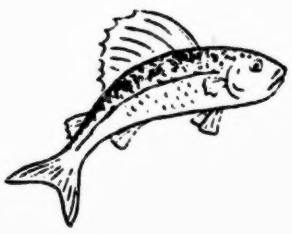
f s h



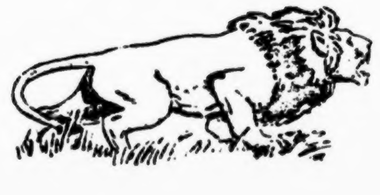
c p m



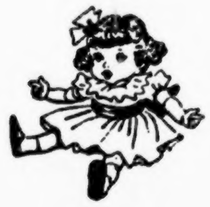
l n b



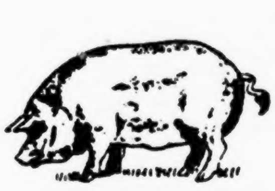
c f w



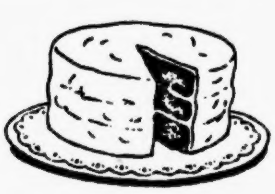
w l r



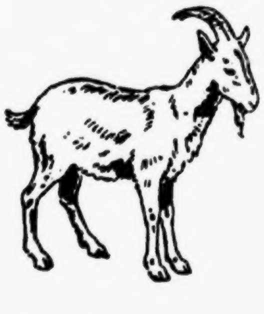
d c h



p r t

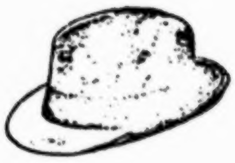


c y m

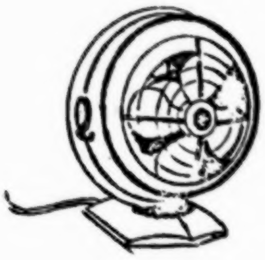


b g c

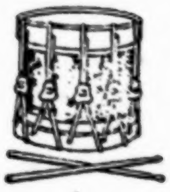
FINAL CONSONANT SUBSTITUTION



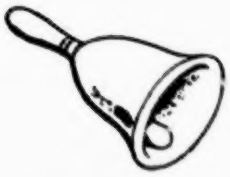
m t d



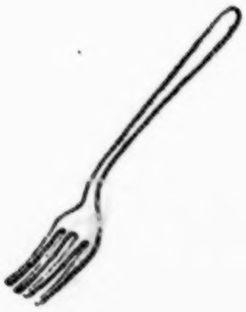
g l n



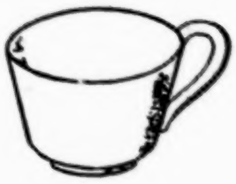
p f m



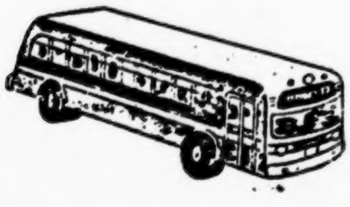
m l s



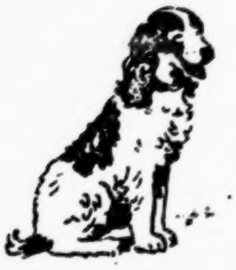
t k p



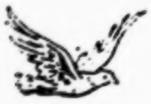
l p k



s p n



g f r



s d n

APPENDIX D

TESTING PROCEDURES

I. Initial Consonant Phoneme Test

A. Sample

1. "Name this picture for me (sun). Yes, this is a picture of the sun. Look at the three letters below the picture. Which letter stands for the sound you hear at the beginning of sun? Yes, the letter s stands for the beginning sound you hear in sun. With your pencil draw a circle around it. Good."

2. "Name this picture for me (book). Yes, this is a picture of a book. Look at the three letters below the picture. Which letter stands for the sound you hear at the beginning of book? Yes, the letter b stands for the beginning sound you hear in book. With your pencil draw a circle around it. Good."

B. Test

1. "Name each picture on this page for me." (Make sure that each child has identified correctly the following names: nest, yarn, turtle, witch, sock, ring, hat, mouse, bed, fish, lion, doll, pig, cake, and goat). TELL THE CHILD THE CORRECT NAME IF HE/SHE DOES NOT KNOW IT.

2. "Now __(name of child)__, look at each picture. Decide with what sound each begins. Then circle with your pencil the letter below each picture that stands for its beginning sound. Good."

II. Final Consonant Phoneme Test

A. Sample

1. "Name this picture for me (pin). Yes, this is a picture of a pin. Look at the three letters below the picture. Which letter stands for the sound you hear at the end of pin? Yes, the letter n stands for the ending sound you hear in pin. With your pencil draw a circle around it. Good."

2. "Name this picture for me (leaf). Yes, this is a picture of a leaf. Look at the three letters below the picture. Which letter stands for the sound you hear at the end of leaf? Yes, the letter f stands for the ending sound you hear in leaf. With your pencil draw a circle around it. Good."

B. Test

1. "Name each picture on this page for me." (Make sure that the child has identified correctly the following names: hat, fan, drum, bell, fork, cup, bus, dog, and bird). TELL THE CHILD THE CORRECT NAME IF HE/SHE DOES NOT KNOW IT.

2. "Now __(name of child)__, look at each picture. Decide with what sound each ends. Then circle with your pencil the letter below each picture that stands for its ending sound. Good."

III. Initial and Final Consonant Substitution

A. Samples

1. Initial Consonant Substitution

"We are going to look at some words now. These words are not real words like cat or dog. They are fake words, but they may remind you of a real word you know. I am going to ask you to help me with these words."

a) "Can you give me a real word you know that looks like this fake word (han) except for the first letter? Good."

(If the child does not answer correctly, write some words which look like (han) except for the first letter such as can, ran, Dan, fan, man, tan).

b) "Pronounce this fake word (han) for me."

(If incorrect, pronounce it for him).

c) "Can you give me a real word you know that looks like this fake word (lin) except for the first letter? Good."

(Again, if the child does not answer correctly, write some words which look like (lin) except for the first letter such as fin, pin, sin, tin, win).

d) "Pronounce this fake word (lin) for me."

(If incorrect, pronounce it for him).

2. Final Consonant Substitution

a) "Can you give me a real word you know that looks like this fake word (tas) except for the last letter? Good."

(If the child does not answer correctly, write some words which look like (tas) except for the last letter such as tag, tap, tab, tam, tan).

b) "Pronounce this fake word (tas) for me."

(If incorrect, pronounce it for him).

c) "Can you give me a real word you know that looks like this fake word (reg) except for the last letter? Good."

(If the child does not answer correctly, write some words which look like (reg) except for the last letter such as red, rest, rex).

d) "Pronounce this fake word (reg) for me."

B. Test

"Now ___(name of child)___, listen carefully. I will ask you a question about each word you see in the open slot of the hand drum. Sometimes it will be about the first letter and sometimes about the last letter. You will not be expected to get all of them right, but just do the best that you can."

(Begin testing with the words on the hand drum. On the scoring form by each number you will find either "Initial" or "Final" written. Use the following directions accordingly):

1. Initial "Can you give me a real word you know that looks like this fake word except for the first letter?"

   "Pronounce this fake word for me."

2. Final "Can you give me a real word you know that looks like this fake word except for the last letter?"

   "Pronounce this fake word for me."

BE SURE TO EMPHASIZE *FIRST* AND *LAST* AS THE WORDS ARE IN RANDOM ORDER. IF YOU NOTICE THAT A CHILD IS SUBSTITUTING THE INITIAL LETTER WHEN HE SHOULD BE SUBSTITUTING A FINAL LETTER SAY *LAST* OR *FIRST* AGAIN. IF YOU DO NOT UNDERSTAND THE CHILD'S PRONUNCIATION, ASK HIM TO SAY THE SAME THING OVER AGAIN BEFORE RECORDING PHONIC TRANSCRIPTIONS.

TAKE A BREAK FOR WATER OR A SHORT STRETCH IF NEEDED.

BE COGNIZANT OF BEHAVIORS DURING TESTING. NOTE ALL ON PAGE THREE OF THE RECORDING FORM AS THESE WILL BE EVALUATED.

APPENDIX E

TABLE VI

PERCENTAGE OF CHILDREN IN THE PILOT STUDY AT EACH READING LEVEL RECEIVING CORRECT ASSOCIATIONS FOR INITIAL CONSONANT SUBSTITUTION

Simulated Words		Reading Levels					
		Low	Per Cent	Average	Per Cent	High	Per Cent
1.	hing	2	29	5	81	7	100
2.	rast	2	29	2	29	4	57
3.	mear	1	14	3	43	6	86
4.	tay	5	81	3	43	5	81
5.	lut	1	14	4	57	7	100
6.	goom	1	14	2	29	3	43
7.	nide	2	29	4	57	6	86
8.	reat	1	14	3	43	4	57
9.	nad	2	29	4	57	7	100
10.	bown	4	57	3	43	5	81
11.	tet	0	00	2	29	3	43
12.	cack	3	43	2	29	5	81
13.	fot	1	14	2	29	4	57
14.	pold	1	14	3	43	6	86
15.	soat	1	14	5	81	7	100
16.	dar	0	00	2	29	4	57
17.	wid	2	29	3	43	4	57
18.	hed	1	14	5	81	2	29
19.	gup	0	00	1	14	5	81
20.	bain	1	14	3	43	3	43
21.	nalk	1	14	1	14	5	81
22.	yit	1	14	3	43	7	100
23.	mun	2	29	7	100	7	100
24.	gop	2	29	4	57	6	86
25.	sout	1	14	2	29	4	57
26.	yill	1	14	3	43	5	81
27.	bim	0	00	1	14	3	43
28.	ren	2	29	3	43	5	81
29.	cump	3	43	5	81	6	86
30.	dall	1	14	5	81	3	43
31.	gake	2	29	6	86	6	86
32.	teep	2	29	4	57	6	86
33.	sig	1	14	1	14	5	81
34.	fand	2	29	5	81	7	100
35.	pame	2	29	7	100	7	100
36.	mick	3	43	3	43	6	86
37.	dat	3	43	4	57	6	86
38.	wook	0	00	6	86	6	86
39.	rell	2	29	5	81	5	81
40.	yight	2	29	4	57	7	100

TABLE VII

PERCENTAGE OF CHILDREN IN THE PILOT STUDY AT EACH READING LEVEL RECEIVING CORRECT ASSOCIATIONS FOR FINAL CONSONANT SUBSTITUTION

Simulated Words	Reading Levels					
	Low	Per Cent	Average	Per Cent	High	Per Cent
1. leat	1	14	2	29	2	29
2. worg	0	00	3	43	2	29
3. puk	0	00	2	29	2	29
4. wik	1	14	2	29	1	14
5. goap	1	14	3	43	3	43
6. ean	0	00	2	29	4	57
7. rad	1	14	2	29	7	100
8. seeg	2	29	5	81	4	57
9. cag	2	29	3	43	3	43
10. mak	2	29	3	43	4	57
11. mep	1	14	4	57	2	29
12. feem	2	29	4	57	5	81
13. cul	1	14	3	43	4	57
14. hig	0	00	4	57	5	81
15. rus	0	00	6	86	5	81
16. bep	2	29	5	81	2	29
17. tos	1	14	1	14	1	14
18. ip	0	00	3	43	4	57
19. tid	0	00	1	14	4	57
20. carm	1	14	3	43	3	43
21. helt	0	00	1	14	3	43
22. san	1	14	4	57	6	86
23. hak	2	29	3	43	3	43
24. fal	1	14	1	14	3	43
25. roat	0	00	2	29	5	81
26. pag	1	14	1	14	4	57
27. huk	0	00	1	14	4	57
28. pim	1	14	3	43	7	100
29. lisk	0	00	1	14	3	43
30. dil	1	14	3	43	3	43
31. nem	0	00	1	14	3	43
32. pok	1	14	2	29	4	57
33. pel	0	00	4	57	3	43
34. mais	0	00	1	14	2	29
35. parl	1	14	2	29	2	29
36. harl	0	00	0	00	1	14
37. beag	1	14	1	14	3	43
38. hon	1	14	1	14	1	14
39. bas	1	14	2	29	4	57
40. bup	2	29	3	43	3	43

APPENDIX F

SIMULATED WORDS FOR THE FINAL MEASURING INSTRUMENT

Initial Consonant Substitution	Final Consonant Substitution
1. bain	1. bas
2. dall	2. beag
3. dat	3. bup
4. fot	4. cag
5. gake	5. carm
6. gop	6. dil
7. hed	7. fal
8. mear	8. feem
9. mick	9. goap
10. nalk	10. hak
11. nide	11. hon
12. rast	12. leat
13. reat	13. mep
14. rell	14. pag
15. ren	15. parl
16. sig	16. pok
17. sout	17. san
18. tay	18. seeg
19. wid	19. tos
20. yill	20. wik

APPENDIX G

FINAL MEASURING INSTRUMENT

1. mun
2. pame
3. pim
4. rus

1. beag
2. seeg
3. tay
4. rell
5. bain
6. hon
7. pag
8. leat
9. parl
10. fal
11. pok
12. mear
13. bas
14. fot
15. bup
16. wid
17. dil
18. carm
19. gop
20. mep
21. dat
22. wik
23. nalk
24. ren
25. cag
26. yill
27. hak
28. dall
29. reat
30. goap
31. san
32. tos
33. sig
34. nide
35. mick
36. sout
37. gake
38. hed
39. rast
40. feem

DATA SHEET

Name________________, __________ ____ Birthday________________

School______________________________ Columbia, Missouri 65201

Teacher______________________ Examiner______________________

RECORD OF SCORES

Initial Consonant Substitution	Number Correct	Per Cent Correct
Grapheme-Phoneme Relationship	________	________
Simulated Word Pronunciations	Number	Per Cent
Pass-Pass	________	________
Pass-Fail	________	________
Fail-Pass	________	________
Fail-Fail	________	________
Total Failed	________	________

Final Consonant Substitution	Number Correct	Per Cent Correct
Grapheme-Phoneme Relationship	________	________
Simulated Word Pronunciations	Number	Per Cent
Pass-Pass	________	________
Pass-Fail	________	________
Fail-Pass	________	________
Fail-Fail	________	________
Total Failed	________	________

Lorge-Thorndike Intelligence Test Date__________

Level 2 Form A Primary Battery

Total Raw Score ________

Deviation IQ ________

Percentile Rank ________

Metropolitan Achievement Test Date__________

Form A Primary II Battery

Test	Word Knowledge	Word Discrimination	Reading	Spelling
Raw Score				
Standard Score				
Stanine				
Grade Equivalent				
Percentile Rank				

RECORDING FORM

INITIAL AND FINAL CONSONANT SUBSTITUTION

Sample Words		Simulated Word	Known Word Recalled	Simulated Word Pronunciation
1.	Initial	mun		
2.	Initial	pame		
3.	Final	pim		
4.	Final	rus		
Main List				
1.	Final	beag		
2.	Final	seeg		
3.	Initial	tay		
4.	Initial	rell		
5.	Initial	bain		
6.	Final	hon		
7.	Final	pag		
8.	Final	leat		
9.	Final	parl		
10.	Final	fal		
11.	Final	pok		
12.	Initial	mear		
13.	Final	bas		
14.	Initial	fot		
15.	Final	bup		

Main List	Simulated Word	Known Word Recalled	Simulated Word Pronunciation
16. Initial	wid	________	________
17. Final	dil	________	________
18. Final	carm	________	________
19. Initial	gop	________	________
20. Final	mep	________	________
21. Initial	dat	________	________
22. Final	wik	________	________
23. Initial	nalk	________	________
24. Initial	ren	________	________
25. Final	cag	________	________
26. Initial	yill	________	________
27. Final	hak	________	________
28. Initial	dall	________	________
29. Initial	reat	________	________
30. Final	goap	________	________
31. Final	san	________	________
32. Final	tos	________	________
33. Initial	sig	________	________
34. Initial	nide	________	________
35. Initial	mick	________	________
36. Initial	sout	________	________
37. Initial	gake	________	________
38. Initial	hed	________	________

Main List		Simulated Word	Known Word Recalled	Simulated Word Pronunciation
39.	Initial	rast		
40.	Final	feem		

APPENDIX H

COLUMBIA PUBLIC SCHOOLS
BOARD OF EDUCATION BUILDING
1002 RANGE LINE - PHONE 314 442-9133
COLUMBIA, MISSOURI 65201
R. LYNN MARINE, DIRECTOR ELEMENTARY EDUCATION

October 1, 1968

Miss Margaret May Griffin
c/o Dr. Artley
Room 215 Hill Hall
University of Missouri
Columbia, Missouri

Dear Miss Griffin:

I am in a position to authorize you to use about 90 students in a research project which you want to work in at the University of Missouri. As I understand, the title for this research is, "Testing for Record Identification Consonant Substitutions as a Technique in Record Identification."

Elementary schools you would be working in would be West Boulevard, Rock Bridge, Russell Boulevard, Blue Ridge and Benton. You should contact the building principals to make definite arrangements in each building.

You would need to send permission slips to the parentsof the children to obtain their permission. As I understand you need second year level children that had their instruction on a first year level in Columbia. This should involve about eighteen children from each of the five schools. You indicated you would give individual tests involving the children about forty minutes each and there would be no later additional testing. I would like a report of this activity.

Yours very truly,

R. Lynn Marine

LM:wa

cc: Mr. Muzzy, West Boulevard
Mr. Mason, Rock Bridge
Mrs. Renfro, Blue Ridge
Mr. Lincoln, Russell Boulevard
Mr. Gunn, Benton

February , 1969

Dear :

Miss Margaret May Griffin, doctoral candidate under the direction of Dr. A. Sterl Artley, Professor of Education, University of Missouri--Columbia, will be conducting a research project this semester regarding a word identification technique in reading at ______________________ Elementary School.

This research project has been approved by Mr. R. Lynn Marine, Director of Elementary Education, Columbia Public Schools, and by ______________________, principal of your school.

Out of a total second-grade population of 299 children, your child was selected randomly as a participant in this study. This means that all 299 children had an equal chance of being selected. However, there will be only 90 children in the project. Each child will be seen individually by Miss Griffin for approximately 40 minutes during only one school day in a room designated for the project within the school building. He/she will be asked to identify 40 words. NO NAMES OF THE CHILDREN SELECTED WILL BE REPORTED NOR LISTED IN ANY PART OF THE RESEARCH PROJECT. Your school will receive a copy of the results of this study as a part of the on-going improvement of instruction for your children.

If you would consider granting approval for ______________ to participate, we would appreciate your signature on the form below as well as the return of this form by your child to his teacher at school.

Thank you for your consideration.

Sincerely,

Principal

Initiator

APPROVAL IS GRANTED FOR ______________________________ TO PARTICIPATE IN THE RESEARCH PROJECT CONDUCTED BY MISS MARGARET GRIFFIN AT ______________________ ELEMENTARY SCHOOL.

____
PARENT

APPENDIX I

TABLE XVII

NUMBER OF CORRECT ASSOCIATIONS IN INITIAL AND FINAL CONSONANT SUBSTITUTION FOR NINETY SECOND GRADERS CLASSIFIED WITHIN THREE LEVELS OF GENERAL READING ACHIEVEMENT ACCORDING TO STANINE SCORES

Child	Level	Stanine	Initial Consonant Substitution	Final Consonant Substitution
1.	High	9	19	13
2.	High	9	19	19
3.	High	9	18	16
4.	High	9	19	18
5.	High	9	19	17
6.	High	9	16	12
7.	High	9	20	18
8.	High	9	18	18
9.	High	9	20	18
10.	High	9	19	10
11.	High	9	13	8
12.	High	9	19	11
13.	High	9	15	12
14.	High	9	15	17
15.	High	9	17	15
16.	High	8	15	15
17.	High	8	11	5
18.	High	8	18	11
19.	High	8	16	8
20.	High	8	16	14
21.	High	8	19	16
22.	High	8	16	5
23.	High	8	15	7
24.	High	8	16	10
25.	High	8	14	10
26.	High	8	17	16
27.	High	8	18	13
28.	High	8	11	4
29.	High	8	19	9
30.	High	8	20	17
31.	High	8	17	9
32.	High	8	16	19
33.	High	8	11	8
34.	High	8	13	13
35.	High	8	19	17
36.	High	7	13	6

TABLE XVII (continued)

Child	Level	Stanine	Initial Consonant Substitution	Final Consonant Substitution
37.	High	7	18	9
38.	High	7	12	5
39.	High	7	15	5
40.	High	7	13	6
41.	High	7	18	14
42.	High	7	15	11
43.	High	7	12	11
44.	High	7	15	6
45.	High	7	12	7
46.	High	7	8	1
47.	High	7	16	13
48.	High	7	13	6
49.	High	7	17	13
50.	High	7	11	7
51.	High	7	15	11
52.	High	7	14	9
53.	High	7	13	7
54.	High	7	9	7
55.	Average	6	12	6
56.	Average	6	9	4
57.	Average	6	9	4
58.	Average	6	9	1
59.	Average	6	7	6
60.	Average	6	18	8
61.	Average	6	7	6
62.	Average	6	12	10
63.	Average	6	5	2
64.	Average	5	13	8
65.	Average	5	9	6
66.	Average	5	10	5
67.	Average	5	6	4
68.	Average	5	14	5
69.	Average	5	9	10
70.	Average	5	6	6
71.	Average	5	7	3
72.	Average	5	7	4
73.	Average	5	14	16
74.	Average	5	7	3
75.	Average	5	7	4
76.	Average	5	7	7
77.	Average	5	10	7
78.	Average	4	5	3

TABLE XVII (continued)

Child	Level	Stanine	Initial Consonant Substitution	Final Consonant Substitution
79.	Average	4	8	5
80.	Average	4	8	7
81.	Average	4	2	2
82.	Average	4	6	5
83.	Average	4	6	4
84.	Average	4	0	1
85.	Average	4	15	6
86.	Low	3	3	1
87.	Low	3	3	0
88.	Low	3	3	2
89.	Low	3	5	4
90.	Low	3	5	3

VITA

Margaret May Griffin

Born: March 7, 1937, Houston, Texas

Education: Southfield School, Shreveport, Louisiana, 1942-1946; Caddo Parish Public Schools, Shreveport, Louisiana, 1946-1948; Rapides Parish Public Schools, Alexandria, Louisiana, 1948-1955; Louisiana State University, Baton Rouge, Louisiana, Bachelor of Science in Education, 1959; Northwestern State College of Louisiana, Natchitoches, Louisiana, Master of Arts in Education, 1967.

Professional Experience: Elementary Teacher, Rapides Parish School District, Alexandria, Louisiana, 1959-1961; Elementary Teacher, Army Dependents Corps, Kaiserslautern, Germany, 1961-1962; Elementary Teacher, Rapides Parish School District, Alexandria, Louisiana, 1962-1966; Graduate Assistant, Northwestern State College of Louisiana, Natchitoches, Louisiana, 1966-1967; Graduate Assistant, University of Missouri, Columbia, Missouri, 1967-1968; Part-time Instructor, University of Missouri, Columbia, Missouri, 1968-1969.